Alakh Sir ke FARREY

(100% Paper Yahi se Aayega)

CLASS 10TH SCIENCE

Saal Bhar Nahi Padha? 4 Din Me 80/80 Pakke Karo

16 - 17 - 18 - 19 - 20 FEBRUARY || LIVE on YouTube

Alakh Pandey - Class 10

Alakh Sir Ke FARREY

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Alakh Sir Ke FARREY*

*Farre = Paper chits to cheat.

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"*Jis rah pe tum chal rahe ho beta, ek din buri tarah phasoge.*"
~Meme wale Gandhiji

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CHEMICAL REACTIONS AND EQUATIONS

CHEMICAL REACTION :- A process in which new chemicals are formed.

CHEMICAL EQUATIONS :- chemical Reaction with symbol and formula.

$H_2(g) + O_2(g) \longrightarrow 2H_2O(l)$
(Reactant) (product)

(aq) - Soluble in water
(ppt)↓ - insoluble in water
(s) - Solid
↑ - Gas

✡ BALANCED CHEMICAL REACTION :-

- Number of Atoms of each element in chemical Equation should be same as LHS = RHS.

LHS RHS
$A_2(g) + B_2(g) \longrightarrow 2AB(g)$

- **Why Balance?**

Conservation of mass - Total mass of Reactant should be equal to total mass of product.

Trick :- • first Balance Metals zn, fe, Na, Al, Mg, Mn, cu, ca, Pb, Ba
• Second Balance Non-Metals Cl, Br, S, N, C
• Third Balance oxygen then 'H'

$Zn + 2HCl \longrightarrow ZnCl_2 + H_2$
$2Pb(NO_3)_2 \longrightarrow 2PbO + 4NO_2 + O_2$

✡ TYPES OF CHEMICAL REACTION :-

(A) COMBINATION REACTION

Two or More Reactant combine to form a single product.

(i) $2Mg(s) + O_2(g) \longrightarrow 2MgO(s)$
(ribbon) (White powder)

✓ Dazzling white light (Very bright light) is emitted.
✓ Heat Evolved - Exothermic Reaction.

(ii) $CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq)$
(Quicklime) (Slaked lime)

✓ Quicklime reacts vigorously with water.
✓ Rise in temperature (exothermicn)
✓ Example of combination and Exothermic reaction.

(iii) $C(s) + O_2(g) \longrightarrow CO_2(g)$
(Burning of coal)

(B) DECOMPOSITION REACTION

One Reactants breaks into two or more products.

(1) Thermal Decomposition

Thermolysis - breaks due to heat.

$CaCO_3(s) \xrightarrow[\Delta]{Heat} CaO(s) + CO_2(g)$
(limestone) (Quicklime)

$2FeSO_4(s) \xrightarrow[\Delta]{Heat} Fe_2O_3(s) + SO_2 + SO_3$
(Green) (Red/Brown)

$Pb(NO_3)_2(s) \xrightarrow[\Delta]{Heat} PbO(s) + NO_2(g) + O_2(g)$
(White) (yellow) (Brown gas)

✓ All 3 are Thermal Decomposition and Endothermic Reaction.
✓ $SO_2(g) + SO_3(g)$ are air pollutant.

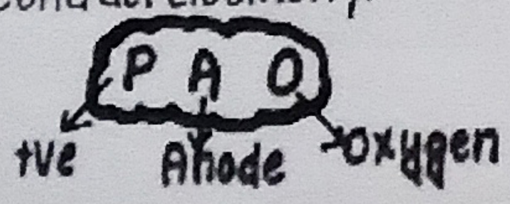
(2) Electrolysis Decomposition

Electrolysis - break due to electric current

$2H_2O(l) \xrightarrow{Electrolysis} 2H_2(g) + O_2(g)$

✓ Volume of gas $H_2 : O_2 = 2 : 1$

✓ Pure water is poor conductor of electricity so a few drop of acids is added, Which is acts as electrolyte and conduct electricity.



(3) Photochemical Decomposition

Photolysis - Breaks due to light

- $2AgCl \xrightarrow{sunlight} 2Ag\downarrow + Cl_2(g)$
(White) (Grey)
- $2AgBr \xrightarrow{sunlight} 2Ag(s) + Br_2(g)$
(yellow) (Grey)

✓ Used in Black and White photography

(C) DISPLACEMENT REACTION

- More reactive element Replace a less Reactive element from its compound.

$A + BC \longrightarrow AC + B$
(A displace)

✡ Reactivity series :-

Potassium kudi	(K)	most reactive
Sodium Naal	(Na)	
Calcium Cat	(Ca)	
Magnesium Mango	(Mg)	
Almunium Alto	(Al)	
zinc Zisko	(Zn)	
Iron Fir	(Fe)	
Lead lekar	(Pb)	
Hydrogen Hum	(H)	
copper chale	(Cu)	
Mercury Mathura	(Hg)	
Silver sath	(Ag)	
Gold Ghumne	(Au)	less reactive

- $Fe(s) + CuSO_4(aq)$ (Blue)
$\downarrow$
$FeSO_4(aq) + Cu(s)$
(Green) (Red/Brown)

- $Zn(s) + CuSO_4(aq) \longrightarrow ZnSO_4 + Cu$
(Blue) (Colourless) (Red)

- $Zn(s) + H_2SO_4(aq) \longrightarrow ZnSO_4 + H_2\uparrow + Heat$

✓ H_2 gas is colourless and odorless, burn with pop sound and extinguishes burning candle.
✓ Temperature increases, reaction is highly Exothermic.

(D) DOUBLE DISPLACEMENT REACTION :-

- Exchange of ions between Reactants.

$A^+B^- + C^+D^- \longrightarrow AD + BC$

- $Na_2SO_4(aq) + BaCl_2(aq) \longrightarrow BaSO_4(s)\downarrow + NaCl$
(Colourless) (Colourless) White ppt
- $Pb(NO_3)_2 + 2KI(aq) \longrightarrow PbI_2\downarrow + 2KNO_3$
lead nitrate (colourless) Potassium iodide (colourless) (yellow ppt)

✓ Example of double displacement and precipitation reaction.

HEAT IN REACTIONS :-

(A) Exothermic Reaction

$A + B \longrightarrow C + Heat$

(1) Respiration

- $Glucose + O_2 \longrightarrow CO_2(g) + H_2O(l) + Energy$

(2) Burning of natural gas

- $CH_4(g) + O_2(g) \longrightarrow CO_2(g) + H_2O(g) + Heat$

(3) Decomposition of vegetables into compost.

(B) Endothermic Reaction

$A + B \xrightarrow{Heat} C$

- All Examples of Decomposition Reaction
- $2\,FeSO_4 \xrightarrow{Heat} Fe_2O_3(s) + SO_2(g) + SO_3(g)$
- $CaCO_3(s) \xrightarrow{Heat} CaO + CO_2(g)$

reaction

REDOX REACTION The Reaction in which oxidation and Reduction occure.

Oxidation

if a chemical (A) → loss of electron
→ Gains of Oxygen
→ loss of Hydrogen

it is called oxidation of A and 'A' is said to be oxidised.

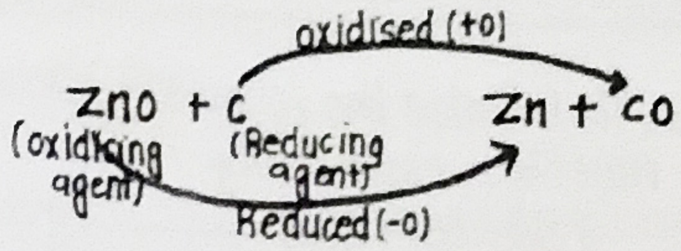
$Cu(s) + O_2(g) \xrightarrow{Heat} CuO(s)$

Reduction

if chemical (B) → Gain of e^-
→ loss of O_2 (oxygen)
→ Gains of Hydrogen

it is called Reduction of B and 'B' is said to be Reduced.

$CuO(s) + H_2(g) \xrightarrow{Heat} Cu(s) + H_2O$



CORROSION :- When a metal is attacked by substances around it such as moisture (water vapour + oxygen), acid etc. it is said to be corrode and this process is called Corrosion.

Examples of corrosion :-

(1) Rusting of iron – Hydrated Reddish Brown iron oxide (rust)
(2) Tarnishing of copper - Green
(3) Tarnishing of silver - Black

RANCIDITY :- • The taste or smell of food material containing fat/oil changes when it is left exposed to air for a long time.
✓ oxidation of fat/oil present in food material causes Rancidity.

Prevention :- (1) Antioxidants
(2) Air tight Container
(3) Bags of chips (Flushed with N_2 gas)

PHYSICAL CHANGE AND CHEMICAL CHANGE

• No chemical Reaction happens. • No new chemical is formed.	• A chemical reaction happens. • shape, size, colour, etc may also change
Examples	Examples
• Boiling water from the • evaporating dish. • Melting of ice to give water. • Melting of wax. • crushing a paper cup. • Crystallisation.	• Burning of papers. • fermentation of grapes. • souring of milk. • curd from milk is left in a room during summer • Rusting of iron. • Food digestion. • Food cooking. • chemical Battery usage.

CURRENT YEAR QUESTIONS (CYQ)

Question-1) To balance the following chemical equation, the values of the coefficients x, y and z must be respectively. [CBSE 2020, 2021, 2023, 2024]

$x\,Zn(NO_3)_2 + Heat \longrightarrow y\,ZnO + z\,NO_2 + O_2$

(a) 4, 2, 1
(b) 4, 4, 2
(c) 2, 2, 4
(d) 2, 4, 2

Balancing a chemical equation or why do you balance a chemical a chemical equation?

Question-2) Ravi was cleaning up his setup when he found a small box containing old chemicals. Among them was a bottle of ferrous sulphate crystals. Curious about the contents, he decided to heat a small portion of the crystals in a dry container, hoping to see some change. As the heat intensified, he observed something unexpected happening to the crystals.

(a) list any two observations he will make.
(b) What type of chemical reactions is occuring when ferrous sulphated is heated
(c) Write the balanced chemical equation for the reaction and name the product

(CBSE 2019, Board Term I, 2017, 2016) (current based Question (CBQ))

Question-3) During a chemistry practical session. Neha and her friends were assigned an experiment. Their teacher provided them with a white crystalline compound in a small test tube and instructed them to heat it gently over a flame using a spirit lamp. As Neha observed, the white compound started decomposing. releasing two different gases. one of the gases had a distinct brown colour, which spread across the test tube, while the other was colorless and had no noticeable odor. A solid yellow residue was left behind at the bottom of the test tube after heating. [CBSE 2020, 2023, 2024] (Current based Question (CBQ))

(a) identify the type of chemical reaction that occured durning the reaction?
(b) Write the balanced chemical equation for the reaction.
(c) What is the name of the brown gas that evolved durning the reaction?
(d) Name the yellow residue left in the test tube and suggest a simple method to test whether it is acidic or basic.

Question-4) A student mixes sodium sulphate powder in barium chloride powder. What change would the student observe on mixing the two powders? Justify your answer the explain how he can obtain the desired change.

[CBSE 2019, 2020, 2021, 2024]

Question-5) In a school lab, a group of students decided to demonstrate the electrolysis of water as part of their chemistry project. They carefully set up the experiment, filling a beaker with water and placing two electrodes into it. To ensure the process was efficient they added a few drops of dilute sulphuric acid to the water. As a electric current passes through the water, they observed the formation of gas bubbles at both electrodes. over time, they noticed that one test tube had twice the amount of gas compared to the other. This observation prompted the students to analyze the phenomenon in more detail. Based on this experiment, answer the following questions [CBSE 2020, 2023, 2024] [CBQ]

(a) identify the gases produced at the anode and the cathode durning the electrolysis of water.

(b) Explain why the volume of gas collected at one of the electrodes is twice the volume at the other electrode.

(c) What do you think would happen if dilute sulphuric acid was not added to the water before the experiment?

Question-6) Which of the following is a redox reaction, but not a combination reaction?

(a) $C + O_2 \longrightarrow CO_2$

(b) $2H_2 + O_2 \longrightarrow 2H_2O$

(c) $2Mg + O_2 \longrightarrow 2MgO$

(d) $Fe_3 + 3CO \longrightarrow 2Fe + 3CO_2$

[CBSE 2022, 2023, 2024]

OR

In the Redox Reaction. $MnO_2 + 4HCl \longrightarrow MnCl_2 + 2H_2O + Cl_2$

(a) MnO_2 is reduced to $MnCl_2$ and HCl is oxidized to H_2O

(b) MnO_2 is reduced to $MnCl_2$ and HCl is oxidized to Cl_2

(c) MnO_2 is oxidized to $MnCl_2$ and HCl is reduced to Cl_2

(d) MnO_2 is oxidized to $MnCl_2$ and HCl is reduced to H_2O.

Question-7) 2 g of silver chloride is taken in a china dish and the china dish is placed in sunlight for some time What will be your observation in this case? Write the chemical reaction involved in the form of a balanced chemical Equation. identify the type of chemical Reaction. (CBSE 2019, 2020, 2021, 2022, 2023) - asked in different formats

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Question-8) Classify the following reactions into different types of reactions.

(i) $AgNO_3(aq) + NaCl(aq) \longrightarrow AgCl(s) + NaNO_3(aq)$

(ii) $CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq)$

(iii) $2KClO_3(s) \longrightarrow 2KCl(aq) + 3O_2(g)$

(iv) $Zn + CuSO_4 \longrightarrow ZnSO_4 + Cu$

[CBSE 2015, 2019, 2020, 2023, 2024]

Question-9) you might have noted that when copper powder is heated in a china dish, the reddish brown surface of copper powder becomes coated with a black substance.

(a) Why has this black substance formed?

(b) What is black substance?

(c) Write the chemical equation.. of the reaction that takes place.

(d) How can the black coating on the surface be turned reddish brown?

✡✡Question-10) Durning a science exhibition, Aryan and his friends setup an experiment to demonstrate the properties of metals They took a shiny piece of metal. 'M' and held it carefully with tongs over a Bunsen burner As the mental heated up, it started to burn with a dazzling white flame. catching the attention of everyone around.

After the flame died out, they noticed a fine white powder. 'N' left on the metal plate beneath the burner The group wondered what had caused the transformation Their teacher challenged them to explain the process and its scientific basis.

Answer the following questions based on Aryan's experiment.

(a) identify the shiny metal 'M' and the white powder 'N' formed durning the reaction.

(b) Represent the reaction with a balanced chemical equation.

(c) Did the shiny metal 'M' undergo oxidation or reduction durning the reaction? support your answer with reasoning. [CBSE 2020, 2021, 2023] [CBSE]

✡Question-11) What happens when food materials containing fats and oils are left for a long time? List two observable changes and suggest three ways by which this phenomenon can be prevented.

[CBSE 2019, 2020, 2023]

✡✡ - Asked in Exam in Different formats

ALAKH SIR ke Farrey.

ACIDS, BASES AND SALTS

Acid :- A substance that gives $H^+(aq)$ as only +ve ion in aqueous solution.

Example:- HCl, H_2SO_4, HNO_3
CH_3COOH (acetic acid)

(i) Acids are sour (khatte) in taste
(ii) Acids turns blue litmus red.

BASE :- A substance which increase Hydroxyl ions $OH^-(aq)$ in aqueous solution.

Example- NaOH, KOH, NH_4OH

(i) Bitter in taste.
(ii) Soapy to touch.
(iii) Base turns red litmus blue.

INDICATORS:- Tells wheater a substance is acid or base.

Indicators	Base	Acids
Litmus	Blue	Red
Turmeric	Red	yellow
Phenolphthalein (Colorless)	Pink	colourless
Methyl Orange Range	yellow	Red

Trick -> LaBouR TRY PoPCorn with MaYoR

(i) Litmus solution is originally purple in colour where no acid or base is added.
(ii) Pure water has no effect on colour of litmus.

OLFACTORY INDICATORS:- substance whose smell odour changes in acidic or basic medium.

Example:- Onion, vanilla essence, clove oil

Acid Retains smell — Base loses smell

ACID AND BASE IN WATER

Acids produce H^+ ions in aqueous Solution :-

$H_2SO_4 \xrightarrow{H_2O} 2H^+(aq) + SO_4^{2-}$

$HCl \xrightarrow{H_2O} H^+(aq) + Cl^-$

$H^+ + H_2O \longrightarrow H_3O^+$ (Hydronium Ion)

$H^+(aq) = H_3O^+$ gives common properties to all acids.

Preparation of HCl gas :-

$2NaCl(aq) + H_2SO_4(conc.) \downarrow \rightarrow Na_2SO_4(aq) + 2HCl(g)$

$HCl(g) \xrightarrow{\text{dry blue litmus}}$ No change

$HCl(g) \xrightarrow{\text{moist blue litmus}}$ Red colour

Alkalis - Some bases are water soluble, these are called Alkalies.

$NaOH(s) \xrightarrow{H_2O} Na^+(aq) + OH^-(aq)$

$KOH(s) \xrightarrow{H_2O} K^+(aq) + OH^-(aq)$

Example:- NaOH, KOH, $NH_4(OH)$

- All Bases are not water soluble.
- Bases but not alkali - $Zn(OH)_2$, $Fe(OH)_2$, $Cu(OH)_2$

Acid + water is a highly Exothermic.

Always add acid slowly to water with constant stirring.

if water is added to a concentrated acid, the heat generated may cause the mixture to splash out and cause burns. The glass container also break due to heat given out.

Trick

AaThuW
Acid to water

Acid and Alkali - Electric current ?

- Electric current through the solution is carried by ions.
- Solution of Acids:- HCl, H_2SO_4, HNO_3 and CH_3COOH generates ions and hence they conduct electricity.
- Alkalis also generate ions - NaOH, KOH, $Mg(OH)_2$, NH_4OH and hence conduct electricity.
- Glucose, Alcohol do not generate ions and hence do not conduct electricity.

REACTION with METAL

Metal + Acid(dil) $\longrightarrow$ Salt + $H_2\uparrow$

Most Reactive
K (Potassium) — Katrina
Na (Sodium) — Ne
Ca (Calcium) — Cas
Mg (Magnesium) — Mangl
Al (Aluminium) — Alto
Zn (Zinc) — Zen
Fe (iron) — Ferrari
Pb (lead) — Fitbl
H (Hydrogen) — Hath
Cu (Copper) — kyu
Hg (Mercury) — Mili
Ag (silver) — Silver
Au (Gold) — Audi
less Reactive

Preparation of Hydrogen gas

$H_2SO_4 + Zn \longrightarrow ZnSO_4 + H_2\uparrow$ (White Vitriol)

- $ZnSO_4$ is white coloured salt called White vitriol.
- H_2 gas burns with pop sound and Extinguishes a candle.
- Combustible but not supporter of Combustion.

Metal + Base $\longrightarrow$ salt + H_2

$2NaOH(aq) + Zn(s) \longrightarrow Na_2ZnO_2(s) + H_2\uparrow$ (sodium zincate)

- Does not happen with all metals.

NEUTRALISATION :-

Acid + Base $\longrightarrow$ salt + water

- $HCl(aq) + NaOH(aq) \longrightarrow NaCl + H_2O$
- $H_2SO_4 + Ca(OH)_2 \longrightarrow CaSO_4 + H_2O$

Metal oxide + Acid $\longrightarrow$ salt + water
(ZnO/CuO/MgO/CaO)

$CuO(s) + 2HCl(dil) \longrightarrow CuCl_2(aq) + H_2O$
(Black solid) (Blue-green)

- Generally Metaloxide are basic in nature because they react with Acid to give salt and water.

Non Metal oxide + Base ⟶ Salt + water
(SO_2/SO_3/CO_2/NO_2)

$CO_2 + Ca(OH)_2\,aq \longrightarrow CaCO_3 + H_2O$

- Generally Non-metaloxide are acidic in nature because they react with base to give salt and water.

Acid + Metal carbonate (CO_3^{2-})
OR
Metal Hydrogen carbonate HCO_3^- (Bicarbonate)
↓
Salt + CO_2 + H_2O↑

CO_2 turns lime water Milky

- $CO_2(g) + Ca(OH)_2$ (lime water) ⟶ H_2O + $CaCO_3(s)$↓ (White ppt) (Calcium Carbonate)

Test :-
on passing excess of CO_2, milkiness disappear.

- $CaCO_3 + H_2O + CO_2 \longrightarrow Ca(HCO_3)_2(aq)$

$Na_2CO_3 + 2HCl \longrightarrow 2NaCl + H_2O + CO_2$

Strength of Acid and Base

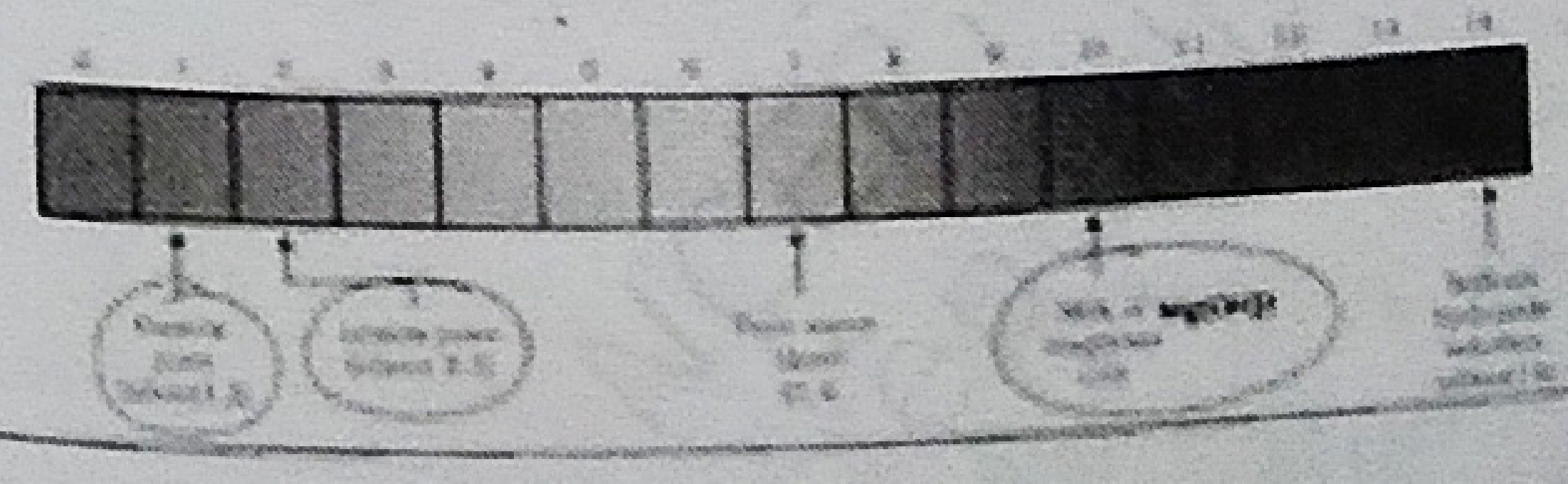
pH : P (Potenz → Power)
H → Hydrogen

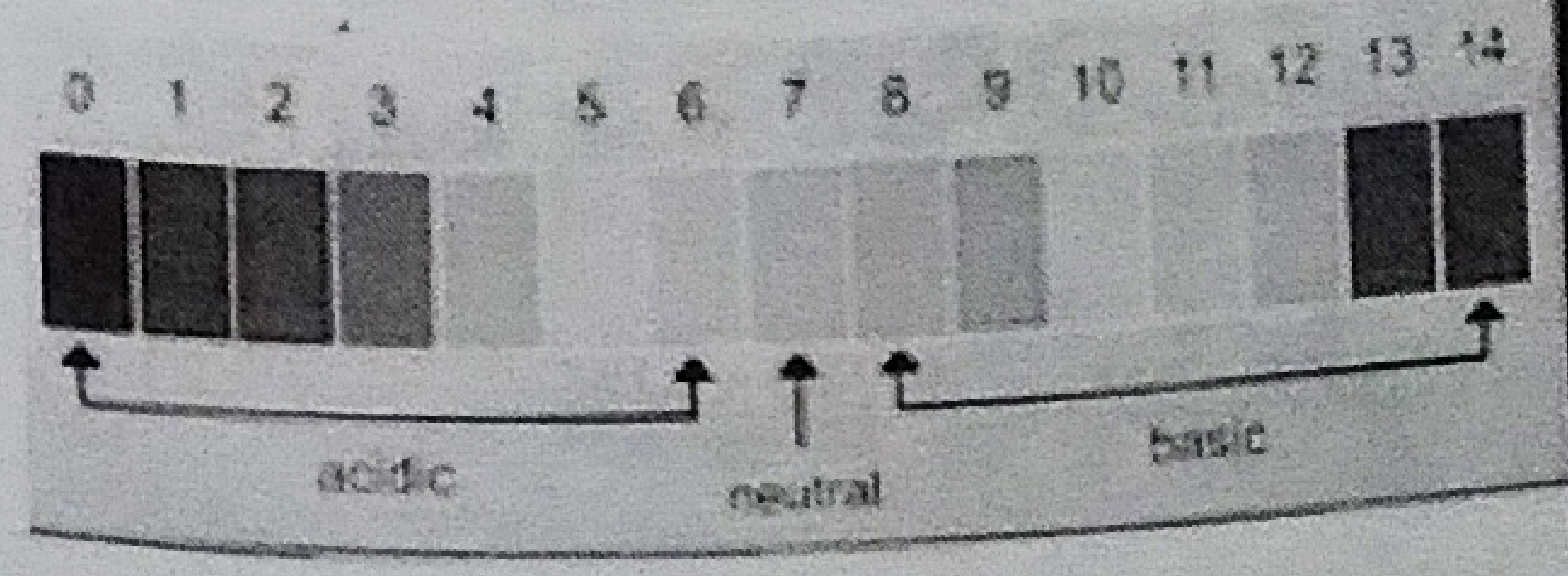
- Measure $H^+(aq)$ ions concentration in a solution.
- pH ranges from 0 (very acidic) to 14 (Very basic)
- pH↓ → $H^+(aq)$↑ → Acidic↑

pH < 7 Acidic
pH = 7 Neutral
pH > 7 Base

Universal Indicator :-

Substance which detect nature of chemical as acid or base and also measure strength of it. eg- pH paper





Strong Acid :- H_2SO_4, HCl, HNO_3
- Gives more concentration of $H^+(aq)$ ions.

Weak Acid :- CH_3COOH (Acetic acid), citric acid, lactic acid, H_2CO_3 (carbonic acid).
(generally organic acids - natural sources)
- Gives less concentration of $H^+(aq)$ ions.

Strong Base :- NaOH, KOH, $Ca(OH)_2$
- Gives more concentration of OH^- ions.

Weak Base :- NH_4OH, $Zn(OH)_2$, $Cu(OH)_2$, $Fe(OH)_2$.
- Gives less concentration of OH^- ions.

pH of salts ?

Acid + Base ⟶ salt + Water

✓ Strong Acid (HCl) + Strong Base (NaOH) ⟶ Neutral salt (→ NaCl) + water $\boxed{pH=7}$

✓ Weak Acid (H_2CO_3) + Strong Base (NaOH) ⟶ Basic salt (→ Na_2CO_3) + Water $\boxed{pH>7}$

✓ Strong acid (HCl) + Weak Base (NH_4OH) ⟶ Acidic salt (→ NH_4Cl) + Water $\boxed{pH<7}$

Naturally Occuring Acids

Natural Source	Acid	Trick
Vinegar →	Acetic Acid →	Sirka pike Acting karne lage.
Orange →	Citric Acid →	Orange check andar city nikli
Tamarind →	Tartaric Acid →	Imlee kotar se bandha.
Tomato →	Oxalic Acid →	Tamatar Ox ne khaya
Sour milk (curd) →	lactic Acid →	Dahi ko lake me feka.
lemon →	Citric Acid →	leman check andar city nikli
Ant sting →	Methanoic acid →	Ant ne khaye Methi ka paratha.
Nettle sting →	Methanoic acid →	Net me fasa Methi ka paratha

Commonsalt (NaCl) [Rock salt] :-

(1) sodium Hydroxide / Caustic soda (NaOH)

- Chlor - Alkali process

$2NaCl(aq) + 2H_2O(l) \xrightarrow{\text{electric current}} 2NaOH(aq)$ (near cathode) + $Cl_2(g)$ (at anode) + $H_2(g)$ (at cathode)
Brine

Chor khali
$\underline{P}\underline{A}r\underline{Cl}$ → Positive Anode chlorine
CHINa → cathode Hydrogen NaOH

- found in deposits in rock bed.
- Raw material for various chemical.

(2) Bleaching powder ($CaOCl_2$)

$Ca(OH)_2$ (slaked lime) + Cl_2 ⟶ $CaOCl_2$ (Bleaching powder) + H_2O

Uses :-

(i) Bleaching cotton and linen, wood pulp in paper factories, Bleaching washed clothes.
(ii) Oxidising agent.
(iii) Make drinking water free form germs.

(3) Baking Soda ($NaHCO_3$)

$NaCl + H_2O + CO_2 + NH_3$
↓
$NaHCO_3 + NH_4Cl$
(sodium Hydrogen carbonate baking soda)

Uses:-
(i) for making tasty crispy pakora.
(ii) for faster cooking
(iii) Neutralise Acidity Antacid.
(iv) Soda-Acid fire extinguisher
(v) Delay curdling of milk.

Baking powder :-
Baking powder = Baking soda + Tartic Acid
$NaHCO_3 + H^+ \longrightarrow CO_2 + H_2O + Salt$
uses :-
- cause bread or cake to rise making them soft or spongy.

(4) Washing Soda ($Na_2CO_3 \cdot 10H_2O$)

$2NaHCO_3 \xrightarrow{Heat} Na_2CO_3 + H_2O + CO_2$

$Na_2CO_3 + 10H_2O \longrightarrow Na_2CO_3 \cdot 10H_2O$

Uses :-
(i) Glass, soap and paper industry.
(ii) Removing permanent hardness.

WATER OF CRYSTALLIZATION :-

- Fixed number of water molecules present in one formula unit of salt.

- $CuSO_4 \cdot 5H_2O$ (copper sulphate Crystals)
- $FeSO_4 \cdot 7H_2O$ (Ferrous sulphate Crystals)
- $CaSO_4 \cdot 2H_2O$ (Gypsum)
- $Na_2CO_3 \cdot 10H_2O$ (washing soda) Sodium carbonate decahydrate)

✡ $CuSO_4 \cdot 5H_2O$ (Blue) $\xrightarrow{Heat}$ $CuSO_4$ (white) + $5H_2O$

✡ $FeSO_4 \cdot 7H_2O$ (Green) $\xrightarrow{Heat}$ $FeSO_4$ (White) $\xrightarrow{Heat}$ Fe_2O_3 (Brown)

Plaster of Paris :- (POP)

$CaSO_4 \cdot \frac{1}{2}H_2O$ — White powder

▲ $CaSO_4 \cdot 2H_2O$ (Gypsum) $\xrightarrow{373k}$ $\frac{3}{2}H_2O + CaSO_4 \cdot \frac{1}{2}H_2O$ (POP)

✡ Plaster of paris is used for making toys, making surface smooth and materials of decoration.

CURRENT YEAR QUESTIONS

QUESTION-1) ☆☆ Riya was helping her brother clean up their old toolbox when she noticed a few pieces of zinc metal. Curious about its properties, she remembered a science lesson where zinc reacts with certain solutions to produce gas. she decided to recreate the reaction at home safely.
Riya placed a few pieces of the zinc metal in a small container and poured a sodium hydroxide solution over it. After gently warming the mixture, she noticed bubbles forming, which she collected using a soapsolution. she then tested the gas to understand its properties.
later, she wondered which gas would form if zinc reacted with a strong acid instead of sodium hydroxide.
(a) Write the equation of the chemical reaction involved and the test to detect the gas.
(b) Name the gas that will evolve when the same metal reacts with a dilute solution of strong acid. (CBSE 2015, 2018, 2024) [CBQ]

QUESTION-2) A student took a small amount of copper oxide in a conical flask and added dilute hydrochloric acid to it with constant stirring. He observed a change in the colour of the solution.
(a) Write the name of the compound formed and its colour.
(b) Write a balanced chemical equation for the reaction involved.
(CBSE 2016, 2021, 2023)

QUESTION-3 ☆☆ An aqueous solution 'A' turns phenolphthalein solution pink. when another aqueous solution 'B' is added to the pink solution, the pink colour disappears. Now When a few drops of solution 'A' are added to this reaction, the mixture appears pink again. The respective changes in the nature of the solution are from.

(a) acidic ⟶ basic ⟶ basic (CBSE 2021, 2022, 2023, 2024) [CBQ]
(b) basic ⟶ acidic ⟶ acidic
(c) acidic ⟶ basic ⟶ acidic
(d) basic ⟶ acidic ⟶ basic

QUESTION-4) ☆☆ Anika's grandmother was preparing pickles at home when she accidentally spilled some pickle juice on her hand. she noticed a sharp change in the smell of her hands. Intrigued, Anika remembered a science project about natural indicators like onion juice. she decided to test the pickle juice, calling it liquid 'X'
with different materials.
she discovered that -

liquid 'X' slightly changed the odour of a cloth strip dipped in onion juice.
liquid 'X' also turned blue litmus paper red, indicating it had a specific chemical property.
To further understand the behaviour of liquid 'X', Anika tested it with.
(a) zinc granules (b) solid sodium carbonate

(CBSE 2019, 2020, 2023) [CBQ]

QUESTION-5) The pH of a salt used to make tasty and crispy pakoras is 9. identify the salt and write a chemical equation for this formation. List its two uses (CBSE 2018, 2019, 2020, 2023, 2024)

QUESTION-6) (i) Define water of crystallisation.

(ii) Write the chemical formula of bleaching powder.

(iii) Write the chemical name and formula of a compound having water of crystallisation in its molecule and appears blue.

Write a balanced chemical equation of the reaction involved in its preparation. List its three uses. (CBSE 2015, 2020, 2023)

QUESTION-7) How is washing soda prepared from sodium carbonate? Give its chemical equation. state the type of this salt. Name the type of hardness of water which can be removed by it. (CBSE 2017, 2020, 2023)

☆☆

QUESTION-8) During a visit to a glass factory. Meera noticed workers handling a white powdery substance labeled 'X' that was being used in the production process. curious, she asked about its uses and learned that this compound is not only important in glassmaking but also plays a role in the soap industry. she also discovered that it is prepared from a saltwater solution called brine.

later, Meera decided to research more about this compound. while studying, she came across an interesting reaction of this substance with water containing salts of calcium or magnesium.

Based on the above context, answer the following questions.

(a) What is the chemical name, common name, and chemical formula of compound 'X'?

(b) Write the chemical equation for the preparation of compound 'X' from brine.

(c) What is the name given to this to this reaction? Are there any gases evolved durning this reaction. What is the location of gases.

(CBSE 2015, 2018, 2020) [CBQ]

☆☆

QUESTION-9) Ravi was helping his father renovate their house when he noticed a worker mixing a white powder with water to repair wall cracks. Curious Ravi asked what the powder was, and the worker explained that it was plaster of paris (POP), a material widely used in construction and decoration. Ravi then remembered learning that POP is made from a mineral called Gypsum.

Ravi wanted to understand more about how POP is obtained and its applications in daily life.

Answer the following Questions:
(a) How is plaster of Paris obtained from gypsum? Write the chemical equation for the process.
(b) List any two uses of plaster of paris. **(CBSE 2016, 2017, 2020, 2024) [CBQ]**

QUESTION-10) When a few drops of universal indicator are added to three colourless solutions, X, Y, and Z. they produce green, red and blue colours, respectively.
(a) Arrange the solutions X, Y, Z in increasing order of pH.
(b) identify which of the three solutions — X, Y or Z — will change the colour of phenolphthalein, and explain the reason for this behavior. **(CBSE 2019, 2019C)**

QUESTIONS-11) What happens when sulphur is burned, and the fumes are collected? if water is added to the test tube containing the fumes and shaken well, how will the resulting solution behave with blue and red litmus paper? Is the product acidic or basic? What would happen if hydrogen chloride gas (HCl) is treated with dry and moist blue litmus. which ion is responsible for the colour change in the case? **(NCERT)**

✡✡ Asked in different format in exam.

ALAKH sir ke FARREY

Metals and Non-Metal

PHYSICAL PROPERTIES :-

METALS :-

(i) Lustrous: have shining surface (pure state). Metallic Luster

(ii) Generally hard

(iii) Malleability: property of substance that it can be beaten into thin sheets. (Gold and Silver Most Malleable)

(iv) Ductility: Ability of metals to be drawn into thin wire (g of Gold metal → 2km length of wire)

(v) Good Conductor of electricity (Best conductor are silver, copper, Gold)

(vi) Good Conductor of Heat (Best conductor are silver, copper)

(vii) Have High Melting point

(viii) Sonorous: Metals that produce a sound on striking a hard surface

(ix) Physical state: All metals except mercury exist as solids at room temperature

Non-Metals :-

(i) Non-Lustrous

(ii) Generally soft

(iii) Non-malleable

(iv) Non-ductile

(v) Poor conductor of electricity

(vi) Poor conductor of Heat

(vii) Low melting point

(viii) Non-sonorous

(ix) solid → Carbon sulphur
liquid → Bromine
Gases → Nitrogen, Oxygen, F_2

Important point (Exception)

METALS :-

(1) Alkali Metals- Li, Na, K are so soft that they can be cut with a knife. (also Ga and Cs)

(2) Gallium (Ga) and cesium (Cs) very soft and have very low Melting point. They melt if you keep them on your palm

(3) Mercury is poor conductor of Heat. (exist at liquid)

(4) lead (Pb) is a poor conductor of electricity.

NON-METALS

(1) Iodine and Graphite are lustrous.

(2) Diamond (form of carbon) is Hardest Natural substance. it has high Melting and Boiling point.

(3) Graphite (form of carbon) is Lustrous, conducts electricity.

(1) copper and Aluminium are used for making cooking vessels. They are good conductor of heat & they do not melt (have high Melting point).

(2) Carbon is a non-metal that can exist in different forms. Each form is called an allotrope.
Eg- Graphite, Diamond, Coal

CHEMICAL PROPERTIES :-

$4K + O_2 \longrightarrow 2K_2O(s)$

$4Na + O_2 \longrightarrow 2Na_2O(s)$

- K and Na react so vigorously with oxygen that they catch fire (Burns in air) even if kept in the open
- They are kept inside kerosene oil to
  (i) Protect them from burning in air
  (ii) Prevents accidental fires.

Metal + Oxygen ⟶ Metal Oxide
(Generally Basic in nature)

✡ $2Mg + O_2 \xrightarrow{Heat} MgO$
(Ribbon) (White powder)

- Mg ribbon burns with dazzling white light.

✡ $4Al + 3O_2 \xrightarrow{Heat} 2Al_2O_3$

- Aluminium burns with a brilliant white flame.

✡ $2Cu + O_2 \xrightarrow{Heat} 2CuO$
(Black layer)

- Cu does' not burn (takes long time)

Gold and silver do not react with oxygen even at high temperature.

Flame Test

Trick-

YELLOW SUN GREEN COP LIQOUR BLACK BIKE CAR ORANGE

Element	Ion	Flame test colour
Lithium	Li^+	Crimson
Sodium	Na^+	Yellow
Potassium	K^+	Lilac
Calcium	Ca^{2+}	Orange-red
Copper	Cu^{2+}	Green

Aqua Regia
freshly prepared mixture of Conc. HCl + Conc. HNO_3 in 3:1
- Dissolves gold
- Highly corrosive & fuming acid

Amphoteric oxide

Metal oxides are generally basic in nature. Turns moist red litmus blue.

Eg- MgO, CuO, Na_2O, K_2O, Fe_2O_3

But some metal oxides show both acidic and basic nature, called Amphoteric oxide.

Eg- oxides of Al and Zn

Base + Acid ⟶ salt + water
$Al_2O_3 + 6HCl \longrightarrow 2AlCl_3 + 3H_2O$

Acid + Base ⟶ salt + water
$Al_2O_3 + 2NaOH \longrightarrow 2NaAlO_2 + H_2O$

Metal + water ⟶ Metal hydroxide/oxide + H_2

$2K + 2H_2O \longrightarrow 2KOH + H_2\uparrow$

$2Na + 2H_2O \longrightarrow 2NaOH + H_2\uparrow$

$Ca + 2H_2O \longrightarrow Ca(OH)_2\uparrow + H_2\uparrow$

$Mg + 2H_2O \longrightarrow Mg(OH)_2 + H_2\uparrow$

$2Al + 3H_2O \longrightarrow Al_2O_3 + 3H_2\uparrow$

$3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$

- Na reacts violently with cold water. Reaction is highly exothermic. $H_2(g)$ evolved catches fire.
- less violent react do not catch fire
- Ca and Mg floats in water as Bubbles of $H_2(g)$ sticks to surface of metal

Reaction with acids :-

Metal + Dil Acid ⟶ salt + $H_2\uparrow$

$Mg + 2HCl \longrightarrow MgCl_2 + H_2$

$2Al + 6HCl \longrightarrow 2AlCl_3 + 3H_2$

$Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$

$Cu + H_2SO_4 \not\longrightarrow$ No reaction

More reactive metals = more heat evolved & more is rate of formation of H_2 gas

Special Case of Nitric Acid :-

Metal + Dil Acid ⟶ salt + H_2

$H_2(g)$ not evolved when a metal reacts with dil HNO_3 (nitric acid)

HNO_3 is strong oxidising agent it oxidises the $H_2(g)$ produced to

$H_2 \xrightarrow[[O]]{HNO_3} H_2O$

and itself gets reduced to (NO, NO_2, N_2O) only Magnesium (Mg) and Manganese (Mn) reacts with very dil HNO_3 to give $H_2(g)$

Displacement Reaction :-

$A + BC \longrightarrow AC + B$

A is more reactive than B

$Fe(s) + CuSO_4(aq) \longrightarrow FeSO_4 + Cu(s)$
(Blue) (Green) Brown

$Zn(s) + CuSO_4(aq) \longrightarrow ZnSO_4(aq) + Cu(s)$
(Blue) (Colourless) (Brown)

$Cu(s) + FeSO_4(aq) \longrightarrow$ No reaction

This reaction can be used to identify more reactive metal.

Metals and Non-Metals Reactivity

Ionic compound / Electrovalent Compounds

Element	Atomic No.	Electronic Configuration
Sodium (Na)	11	2,8,1
Magnesium (Mg)	12	2,8,2
Calcium (Ca)	20	2,8,8,2
Chlorine (Cl)	17	2,8,7
Oxygen (O)	8	2,6

Formation of Calcium Oxide (CaO)

Ca(20) ⟶ 2,8,8,2
O(8) ⟶ 2,6
Ca ⟶ $Ca^{2+} + 2e^-$
O + 2e ⟶ O^{2-} electron dot structure

Formation of Sodium Chloride (NaCl)

Na(11) ⟶ 2, 8, 1 ⟶ Na ⟶ $Na^+ + e^-$
Cl(17) ⟶ 2, 8, 7 ⟶ Cl + e^- ⟶ Cl^-

- Na^+ and Cl^- ions (oppositely charged) attract each other.
- Na^+ and Cl^- are held together by strong electrostatic forces of attraction.
- sodium chloride (NaCl) do not exist as molecule but as combination of oppositely charged ions → ionic compound / Electrovalent compound.

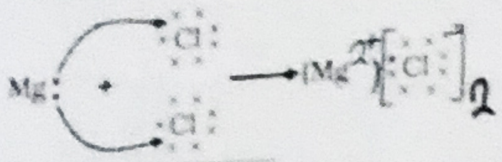
Formation of Magnesium chloride ($MgCl_2$)

Mg(12) ⟶ 2, 8, 2

Cl(17) ⟶ 2, 8, 7

$Mg \longrightarrow Mg^{+2} + 2e^-$

$Cl + e^- \longrightarrow Cl^-$



Ionic / Electrovalent Compounds Properties

(1) Hard, solid compounds because of strong force of attraction between +ve and -ve ions. Brittle in nature, Breaks into pieces if pressure is applied.

(2) Have High Melting and Boiling point Because large amount of energy is required to break strong interionic attraction.

(3) Generally soluble in water but insoluble in solvents like kerosene, petrol, alcohol etc.

(4) In solid state do not conduct electricity as ions cannot move because of strong electrostatic force of attraction.

(5) In Molten state, Heat energy weakens the strong electrostatic forces of attraction and ions can move freely, hence in molten state, conduct electricity.

(6) In aqueous solution, conducts electricity as solution of ionic compound in water contains ions.

ions move to opposite electrodes (water weakens the strong electrostatic forces of attraction between ions).

Extraction of Metals

(1) Minerals :- elements or compounds which occur naturally in earth's crust.

(2) Ores :- Those minerals which contain a very high % of a particular metal and metal can be profitably extracted from it, are called ores.

Top in Activity Series

5 — K, Na, Ca, Mg, Al — very reactive, so never found in free state as free metal

3 — Zn, Fe, Pb, H — Middle of Activity Series — moderately reactive found in earth's crust in form of oxides, sulphides and carbonates.

5 — Cu, Hg, Ag, Au, Pt — least reactive, hence found in free state as free metals as well as compounds form. — low in Activity series

Extracting Metal → Middle of Activity Series

Present as oxides, sulphides or carbonates in nature

Sulphides / carbonates converted to oxide as its easy to extract metal from oxide

Roasting :- Heating sulphide ores strongly in presence of excess air

$2ZnS + 3O_2 \xrightarrow{Heat} 2ZnO + 2SO_2$

Calcination :- Heating carbonate ores strongly in limited air or in absence of air

$ZnCO_3 \xrightarrow{Heat} ZnO + CO_2$

Now, metal oxide is reduced (removal of oxygen) with help of Reducing agent Carbon (coke).

$ZnO + C \longrightarrow Zn + CO$

Extracting Metals → Top of Activity series

Carbon cannot reduce their oxides, these metals are very reactive and have More affinity (likeness) for oxygen than Carbon.

- Such Metals are obtained by Electrolytic Reduction (Reduction with help of electric current)
- Na, Ca, Mg → electrolysis of molten chlorides

At cathode: $Na^+ + e^- \longrightarrow Na$ (reduction)

At Anode: $2Cl^- \longrightarrow 2e + Cl_2$ (oxidation)

$2NaCl_{(molten)} \xrightarrow{\text{electric current}} 2Na_{(s)} + Cl_{2(g)}$

Refining of Metals

- Metal obtained after carbon reduction or electrolytic reduction is not very pure
- The most common method for refining metal is Electrolytic refining.

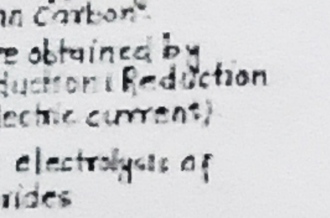
At Anode: Pure copper dissolves in solution

At Cathode: Equivalent amount of pure copper from solution deposits at cathode.

Corrosion :- When a metal is attacked by substance around it such as moisture (water vapour + oxygen), acid etc. it is said to be corrode and this process is called corrosion.

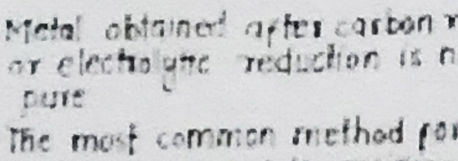
Examples —

(1) Rusting of iron

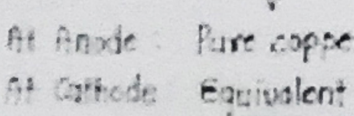


$2Fe + \frac{3}{2}O_2 \cdot xH_2O \longrightarrow 2Fe_2O_3 \cdot xH_2O$

(2) Tarnishing of copper



(3) Tarnishing of silver



Note - Corrosion is an example of oxidation.

$2Cu(s) + H_2O(g) + CO_2(g) \longrightarrow CuCO_3(s)$

$Cu(OH)$

Prevention of corrosion :-

- Painting
- Oiling
- Greasing
- Galvanising
- Anodising

Galvanisation :-

- steel and iron are coated with thin layer of zinc
- It is done through electrolysis
- it does not change property of metal.

Anodising :-

process of forming a thick oxide layer of Al. This layer prevents corrosion of Al metal. The oxide layer also give Al articles attractive finish.

Alloy :- A homogenous mixture of two or more metals, or a metal and non metal.

Step-1 Melting primary metal

Step-2 Dissolving other elements in fixed proportions

Step-3 Cooling to room temperature.

The properties of An Alloy is different from the metals from which it obtained.

(1) Pure iron is very soft and streches easily when hot pure iron + carbon (0.05%) → Hard and strong iron carbon Alloy

(2) Stainless steel → Alloy of Fe - C

(3) Amalgam → Alloy in which one metal is mercury.

(4) Brass (BCoZ) → Alloy of Zn + Cu

(5) Bronze (CoaT) → Alloy of copper & Tin (Cu + Sn)

(6) Solder (SoTeLa) → Alloy of lead & Tin (Pb + Sn)

Thermit Reaction / Welding

$Fe_2O_3 + Al \longrightarrow Al_2O_3 + Fe + Heat$

(s) (s) (s) (l)

The above reaction is so highly exothermic that heat given out procluces metal in molten state. This molten metal is used to Join railway tracks or cracked machine parts. This reaction is known as thermit reaction.

CURRENT YEAR QUESTIONS

QUESTION-1) (a) Name the following.
(i) Metal that can be cut by a knife. (CBSE 2019, 2022, 2024)
(ii) Lustrous non-metal.
(iii) Metal that exists in liquid state at room temperature.
(iv) Most malleable and ductile metal
(v) Metal that is the best conductor of electricity.
(vi) Non-metal that can exist in different forms.
(b) How are alloys better than metals? Give the composition of solder and amalgam.

QUESTION-2) Three metal samples of magnesium, aluminium, and iron were taken and rubbed with sandpaper. These samples were then put separately in test tube containing dilute hydrochloric acid. Thermometers were also suspended in each test tubes so that their bulbs dipped in the acid. The rate of formation of bubbles was observed. The above activity was repeated with dilute nitric acid and the observations were recorded. Answer the following questions.

(a) When the activity was done with dilute hydrochloric acid, then in which one of the test tubes was the rate of formation of bubbles the fastest and the thermometer showed the highest temperature.

(b)(i) Why does hydrogen gas not evolve when a metal reacts with dilute nitric acid? Name the ultimate products formed in the reaction.

OR

(ii) Name the type of reaction on the basis of which reactivity of metals is decided. you have two metals X and Y. How would you decide which is more reactive than the other? (2020, 2021, 2024) [CBE]

QUESTION-3) (a) Name the process of reduction used for a metal that gives a vigorous reaction with air and water both. (2019, 2022, 2023) [CBE]

(b) Carbon cannot be used as a reducing agent to obtain aluminium from its oxide? Why?

(c) Differentiate between roasting and calcination giving a chemical equation for each.

QUESTION-4) (a) Where is iron placed in the reactivity series of metals? Write the form/forms in which its ores are found in nature.
(b) Differentiate between roasting and calcination.
(c) Explain any two methods that are employed to prevent rusting/corrosion of metals.

OR

(c) Why is aluminium used to join railway tracks or the cracked machine parts of iron? Write a balanced chemical equation for the reaction which occurs. (CBSE 2017, 2019, 2023) [CBE]

QUESTION-5) Write balanced chemical equations to explain what happens, when
Mercuric oxide is heated.
A mixture of cuprous oxide and cuprous sulphide is heated.
Ferric oxide is reduced with aluminium. [CBSE 2020, 2021, 2022]
Zinc carbonate undergoes calcination.

QUESTION-6) An ore on treatment with dilute hydrochloric acid produces brisk effervescence. Name the type of ore with one example. What steps will be required to obtain metal from the enriched ore? Also, write the chemical equation for the reactions involved in the process. [CBSE 2018, 2019, 2020, 2023]

QUESTION-7) A metal 'A' reacts violently with cold water and the gas evolved catches fire. Another metal 'B' when dipped in water starts floating. The metal 'C' does not react either with cold or hot water, but reacts with steam. The metal 'D' does not react with water at all, identify the metals 'A', 'B', 'C' and 'D'.
CBSE 2017, 2019, 2023)

QUESTION-8) (CBSE 2015, 2018, 2024) [CBQ]

Answer the following questions.

(i) In the electroytic refining of copper, what materials are used for the cathode and anode?
(ii) Name the solution used in this process and write its chemical formula.
(iv) How does copper get refined when an electric current is passed through the electrolytic cell?

QUESTION-9)

Ananya's family owns a small ornamental metal workshop where different metals like copper, zinc, and aluminium are used to create decorative items. One day, while cleaning an old iron ornament, she noticed that some parts had changed colour due to exposure to moisture. This made her curious about how metals interact with different solutions.

To satisfy her curiosity, she conducted a small experiment at home. She prepared four glasses of pale green ferrous sulphate solution and added small pieces of copper, zinc and aluminium in to three of them, leaving one untouched for comparison. After some time, she noticed interesting changes in the solutions and the metal pieces?

Answer the following questions.

(a) In which glass will the colour of the ferrous sulphate solution remain unchanged? Explain why.
(b) In which case will the solution fade in colour?

QUESTION-10)

(a) What happens when copper is heated in air? (Give the equation of the reaction involved)
(b) Why are some metal oxides categorized as ampholeric? Give one example.
(c) Complete the following equations.
(i) $Na_2O(s) + H_2O(l)$
(ii) $Al_2O_3(s) + 2NaOH(aq)$ [CBQ]

QUESTION-11) (1) Draw e^- dot structure of CaO
(2) Explain why CaO does not conduct electricity in solid state. How will it conduct electricity then?

QUESTION-12) (1) What are allotropes?
(2) What is Aqua regia?

ALAKH SIR ke FARREY

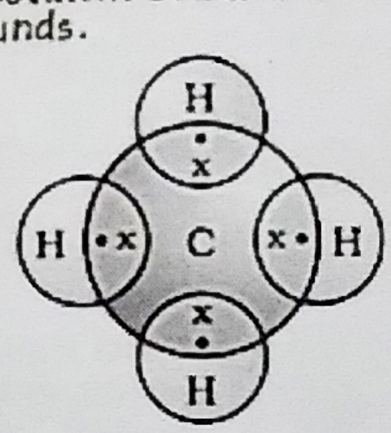
CARBON AND ITS COMPOUNDS

Carbon:-

- Atomic No. → 6 4e⁻
  C(6) → 2, 4 → 4e⁻
- To attain Noble gas octet 8e⁻ configuration.

- carbon has to
  - C^{4+} lose 4e⁻ — Requires lot of energy as 6 protons in nucleus will pull e⁻ strongly.
  - C^{4-} Gain 4e⁻ — Difficult to hold 10e⁻ with 6 protons in nucleus

☆ So carbon shares 4e⁻ and always form covalent bonds and Covalent compounds.

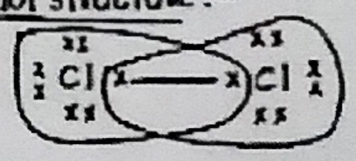


Properties of Covalent Compounds

(i) Generally Poor conductor of electricity.
- Absence of ions.

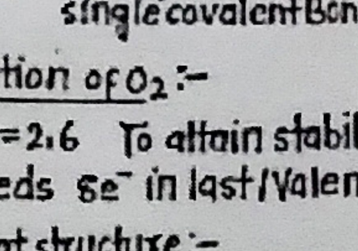
(ii) Generally low melting and Boiling points.
- Because they have weak Intermolecular forces.

- Formation of Cl_2 :-
  Cl (17) = 2,8,7 → valence shell
  e⁻ dot structure :-



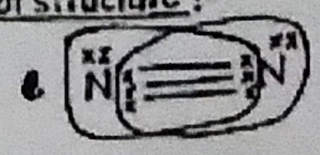
Cl — Cl
single covalent Bond

- Formation of O_2 :-
  O (8) = 2,6 To attain stability O needs 8e⁻ in last/Valence shell.
  e⁻ dot structure :-



O = O
Double covalent Bond

- Formation of N_2 :-
  N (7) = 2,5
  e⁻ dot structure :-



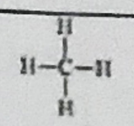
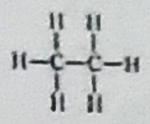
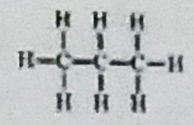
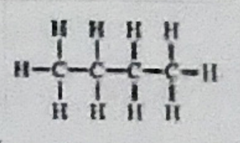
N ≡ N
Triple Covalent Bond

Naming *learn

1C - Meth	6C-Hex
2C - Eth	7C-Hept
3C - Prop	8C-Oct
4C - But	9C-Non
5C - Pent	10C-Dec

Carbon Carbon single bond - ane

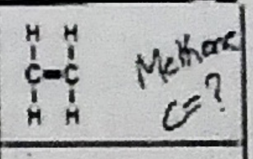
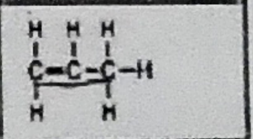
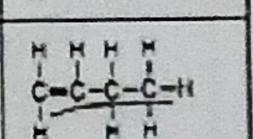
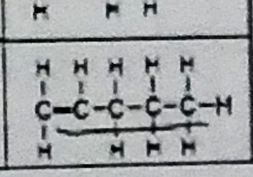
Alkanes

Methane	CH_4	
Ethane	C_2H_6	
Propane	C_3H_8	
Butane	C_4H_{10}	

Formula :- C_nH_{2n+2}

Carbon Carbon double bond = ene

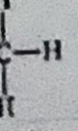
Alkene

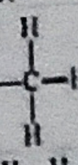
ETHENE	C_2H_4	 Methene ☺?
PROPENE	C_3H_6	
BUTENE	C_4H_8	
PENTENE	C_5H_{10}	

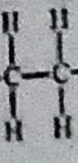
Formula :- C_nH_{2n}

Carbon Carbon triple Bond ≡ yne

Ethyne — 

Propyne — 

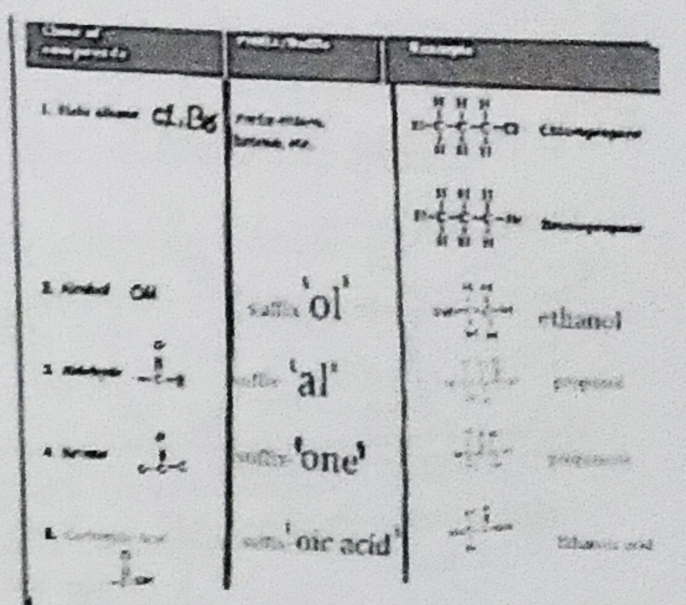
Butyne — C_4H_6 

Pentyne — 

Formula :- C_nH_{2n-2}

Functional Group :-

Atoms or groups of atoms which gives chemical properties to compound.



Homologous series :-

A series of compound with same functional Group, same General formula and similar chemical properties where each consecutive member differs by $-CH_2$.

Eg:- Alkane = C_nH_{2n+2}
Alkene = C_nH_{2n}

CH_4 —14amu→ C_2H_6 —14amu→ C_3H_8
C_2H_4 C_3H_6

C = 12 amu
H = 1 amu
O = 16 amu
N = 14 amu

(1) Molecular mass increase moving up homologous series.
CH_4 —$+CH_2$→ C_2H_6 (14amu)

(2) Melting and boiling point up the series.
Reason- They increase with molecular mass Gradation in other physical properties like solubility.

(3) chemical properties are same for a homologous series.
Reason - chemical properties are same because of functional group which remains same in HS.

Isomers:- compounds with same molecular formula but different structure and this phenomenon is called isomerism.

(1) Butane (4C)
- C_4H_{10} 4C chain
  (a) $H_3C-H_2C-H_2C-CH_3$ straight chain
  (b) $H_3C-CH(CH_3)-CH_3$ 3C chain, CH_3 Branched chain — Isomers

C_3H_6O :
(a) $H_3C-HC(=O)-H$ → propanal, Aldehyde
(b) $H_3C-C(=O)-CH_3$ → propanone, Ketone

Saturated Compounds :-

✓ Which has carbon- Carbon single bonds only.

C–C C–C–C

✓ Ethane

✓ Stable

✓ less Reactive

Unsaturated Compounds

✓ Which has Carbon - carbon Double or triple Bond.

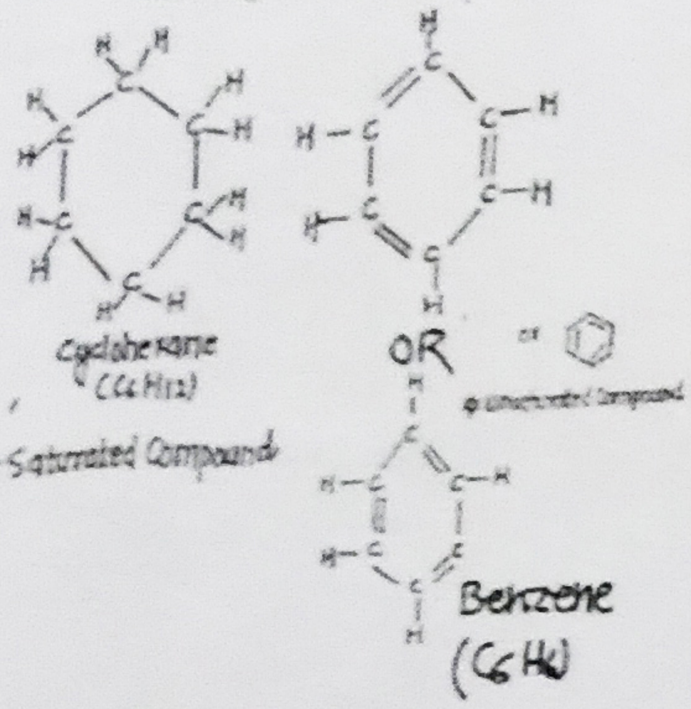
✓ C=C → Ethen

C≡C → C_nH_{2n-2}

✓ Reactive unstable.

✓ More Reactive

Ring of Carbon



☆ Saturated Compound

☆ Unsaturated Compound

Allotropy :-

- The phenomenon of existence of an element in two or more forms which have different physical properties but identical chemical properties.
- carbon exist in different forms in nature like Diamond and Graphite.

This phenomenon is called allotrophy and these different forms are called allotropes.

- Graphite is smooth and slippery.
- Diamond is hardest substance.

Catenation :- C–C–C–C

- property of carbon to self link and form long chains of carbon atoms, branched chain of carbon atoms or ring of carbon atoms.
- This is the biggest reason that Carbon forms millions of compounds. food, paper, clothes, Human body all contains carbon compounds.

Tetravalency :-

carbon forms four covalent bonds due to small size of carbon, it's compounds are highly stable.

ETHANOL (CH_3-CH_2-OH) ****

(1) $2CH_3-CH_2-OH + 2Na \rightarrow 2CH_3-CH_2-ONa + H_2$ ↑ (Burns with a Pop sound)

(Acid) → (sodium ethoxide)

(2) $CH_3-CH_2-OH \xrightarrow[\text{Excess conc. } H_2SO_4,\ \text{Heat}]{443K} CH_2=CH_2 + H_2O$

(ethene)

Conc H_2SO_4 Dehydrating agent hai (pani nikalne wala). This reaction is called Dehydration of ethanol.

(3) $CH_3-CH_2-OH \xrightarrow{\text{(i) Alkaline } KMnO_4 \text{ Heat (Alkaline potassium permanganate)}}_{\text{(ii) Acidified } K_2Cr_2O_7 + \text{Heat (Acidified potassium dichromate)}} CH_3-COOH$

(ethanol) ← (ethanoic acid (colourless))

OR O_2

1 and 2 are oxidising agent. This is oxidation of ethanol. Addition of oxygen to ethanol happens. Purple colour of Alkaline $KMnO_4$ disappears.

ETHANOIC ACID (CH_3-COOH)

Reaction of Acid ⟶ H^+ ions release

(1) $CH_3-COOH + NaOH \rightarrow CH_3COONa + H_2O$ (water)

(Acid) (Base) → (sodium ethanoate) [sodium salt]

(2) $2CH_3-COOH + Na_2CO_3 \rightarrow 2CH_3COONa + CO_2 + H_2O$

(Acid) (Metal carbonate) → (salt)

$CH_3-COOH + NaHCO_3 \rightarrow CH_3COONa + CO_2 + H_2O$

(Acid) (Metal bicarbonate) → (salt)

Test for CO_2 gas → Turns lime water milky and milkiness disappears in passing excess of gas.

(3) Esterification :- Ethanoic acid + Ethanol

$CH_3-COOH + CH_3-CH_2-OH \underset{\text{reversible reaction}}{\overset{\text{acid-catalyst}}{\rightleftharpoons}} CH_3COO-CH_2-CH_3 + H_2O$

(Acid) (Base) (Ester)

☆ Ester are sweet smelling substances, used in making perfumes and flavouring agents.

(4) Saponification – Ester + NaOH

$CH_3-COOCH_2-CH_3 + NaOH \rightarrow CH_3-CH_2-OH + CH_3COONa$

(ester) → (ethanol) + (soap / salt) (soap industry)

Addition Reaction :-

- Unsaturated compounds Alkene, Alkynes

$CH_2=CH_2 + H_2 \xrightarrow[\text{Platinum / palladium catalyst}]{\text{Nickel catalyst}} CH_3-CH_3$

(ethene) → (ethane) (saturated)

- Hydrogenation - Addition of Hydrogen
- Reaction is used in Hydrogenation of vegetable oil''

Substitution Reaction :-

For saturated compounds Alkane.

$CH_4 + Cl_2 \xrightarrow{\text{sunlight}} CH_3Cl + HCl$

(methane) → (chloromethane)

Saturated Compound are less reactive.

Combustion :-

(1) Complete Combustion (In supply of air)

$CO_2 + H_2O + \text{Heat}$

$CH_4 + O_2 \rightarrow CO_2 + H_2O + \text{Heat}$

$CH_3CH_2OH + 3O_2 \rightarrow 2CO_2 + 2H_2O + \text{Heat}$

Saturated Hydrocarbon → clean blue flame

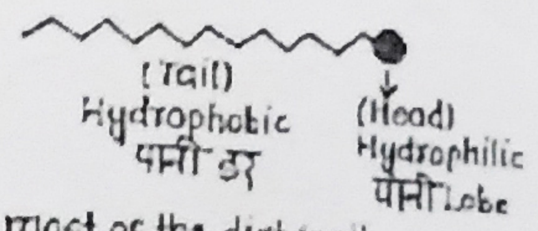
Unsaturated Hydrocarbon → yellow flame with lot of black smoke

(2) Incomplete Combustion → limited supply of air → yellow flame

- product are H_2O, CO and C (black carbon soot)

Soaps :-

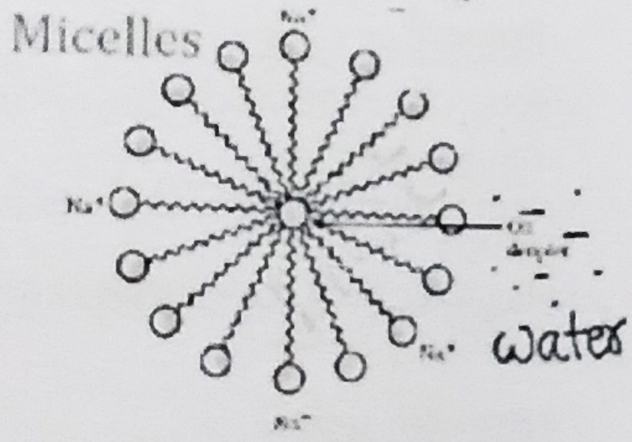
- Molecules of soaps are sodium or potassium salts of long-chain carboxylic acids.



- most of the dirt is oil.

Head - Towards water

Tail - Towards oil



Hard water :-

- water that contains of calcium and Mg salts, bicarbonates, chlorides, sulphates.

Soap

(i) They are sodium salts of long chain fatty acids.

(ii) Soaps cannot be used with hard water.

(iii) Do not give foam with hard water.

(iv) They form precipitate with salts present in Hard water.

Detergents

(i) These are sodium or potassium salts of sulphonic acids of hydrocarbons.

(ii) Detergents work well with hard and soft water both.

(iii) Give foam with hard water.

(iv) Do not form precipate with hard water.

CURRENT YEAR QUESTIONS [CYQs]

QUESTION-1) Why do covalent compounds have low melting and boiling points? Why are covalent compounds poor conductor of electricity? [2015, 2019]

QUESTION-2) (a) A compound 'X' on heating with excess conc. sulphuric acid at 443K gives an unsaturated compound 'Y'. 'X' also reacts with sodium metal to evolve a colourless gas 'Z'. identify 'X', 'Y' & 'Z'. Write the equation of the chemical reaction of formation of 'Y' and also write the role of sulphuric acid in the reaction.

(b) What happens when ethanol reacts with ethanoic acid in the presence of concentrated H_2SO_4? state the class of compound to which the fruity smelling compounds belong. Write the chemical equation for the reaction and write the chemical name of the product formed.

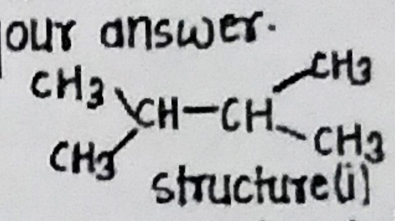
(c) Write the balanced chemical equations of the following with ethanoic acid and name the main products. [2017, 2018, 2023 CBQ]
- sodium Hydroxide
- Sodium

QUESTION-3) (a) Why is the conversion of ethanol to ethanoic acid considered an oxidation reaction? Name the oxidizing agent used and write a balanced chemical equation for this reaction.

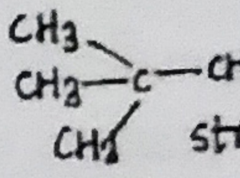
(b) Write chemical equations for the following. (i) $CH_3COOH + NaHCO_3 \rightarrow$

(c) Ethanol undergoes a reaction that produces carbon dioxide and water. Identify the process and write a balanced chemical equation.

How are structure (i) and structure (ii) given below related to one another? Give reason to justify your answer. [2015, 2016, 2017]



structure (i)



structure (ii)

Draw one more possible structure for above case.

(ii) Differentiate between unsaturated and saturated carbon compounds on the basis of their General formula.

QUESTION-4) (a) When ethanol is heated in excess with concentrated sulphuric acid at 443K, it forms an unsaturated hydrocarbon.
- identify the hydrocarbon and draw its electron-dot structure.
- What happens when hydrogen is added to this hydrocarbon in the presence of a nickel or palladium catalyst? Write the equation and state an industrial application of this reaction.

(b) Distinguish between esterification and saponification reactions with the help of chemical equations. Mention one use for. [2015, 2016, 2017, 2024]
- Esters
- The saponification process.

(c) How can we experimentally differentiate between an alcohol and a carboxylic acid?

QUESTION-5) (a) Write the formula and the molecular mass of the third homologue of alcohols. state how the boiling point of an alcohol changes as one moves from lower to higher homologues.

(b) Write the chemical formula of two consecutive homologous of organic compounds having functional group $-OH$. What happens to the (i) boiling point & (ii) solubility of organic compounds of a homologous series as the molecular mass increases?

(c) Draw two different possible structures of a saturated hydrocarbon having four carbon atoms in its molecule. What are these two structures of the hydrocarbon having same molecular formula called? Write the molecular formula and the common name of this compound. [2019, 2021-22]

QUESTION-6) (a) Explain why we cannot have isomers of the first three members of the alkane series.

(b) How would you convert propanol to propanoic acid? Write the chemical equations for both conversions and state the type of reaction involved. [2019, 2020, 2023]

QUESTION-7) (a) Why does carbon form compounds mainly by covalent bonding?
(b) What makes carbon exceptionally stable in its compounds?
(c) Write the number of covalent bonds in the molecule of butane C_4H_{10}.
[2015, 2019, 2020, 2023]

QUESTION-8) You want to test for hardness of water, but hard water is not available in the laboratory. Which of the following compounds may be dissolved in pure water make it hard? [2020, 2017, 2015, 2023]
(i) Hydrogen carbonate of sodium
(ii) Sulphate of magnesium
(iii) Chloride of calcium
(iv) carbonate of sodium
Select the correct option and explain your choice.

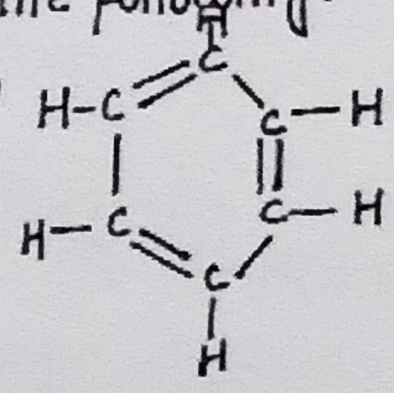
QUESTION-9) (a) With the help of a diagram, show the formation of micelles when soap is applied to only dirt. Explain how the formation of micelles helps in cleaning clothes with greasy stains. (b) Take two test tubes X and Y, each containing 10mL of the hardwater.
- In test tube 'X' add a few drops of soap solution.
- In test tube 'y' add a few drops of detergents solution.
- shake both test tubes for the same period.

(i) In which test tube will foam formation be more? Why?
(ii) In which test tube will a curdy solid form? Why?
(c) Would you be able to check if water is hard using a detergent? Justify your answer. [2023, 2016, 2018]

QUESTION-10) (a) A compound 'X' undergoes an addition reaction with H_2 to form compound 'Y'. Which has a molecular mass of 30 g/mol.
- 'X' decolorizes bromine water and burns with a smoky flame.
- Identify 'X' and 'Y' and write the chemical equations of the reaction involved.

(b) Carry out the following conversions, mentioning the conditions required for each reaction. [2020, 2019, 2016]
- Ethanoic acid from ethanol.
- Ethane from ethene.

QUESTION-11) (i) Draw the structures of propanol, propanone, Butanoic acid, chloropentane.
(ii) Name the following:

(a) 

(b) $CH_3-CH_2-CH=CH_2$

[2020, 2029]

Asked in CBSE Formate changed

ALAKH Sir ke Fanney

LIFE PROCESSES

LIFE PROCESSES:- The Basic and essential functions/ process performed by living organisms to maintain their life.

Nutrition:- The process of obtaining and utilisation of food.

Respiration:- The process of breaking down of food to obtain energy.

Transportation The process of transfer of substances from one part of the body to other parts.

Excretion:- The process of removal of waste materials produced in the cells of their body.

NUTRITION

Autotrophic Nutrition

- The organism makes its own food from simple inorganic materials.

Example:- Green plants.
Autotrophic Bacteria.

Heterotrophic Nutrition

- Organism cannot make (or synthesize) its own food from simple inorganic materials. They depend on other organisms for their food.

Holozoic:- Organisms consume and internally digest complex organic food substances.

e.g:- Human beings Dog cat, Amoeba

Saprophytic:- organisms feed on dead and decaying organic matter.

e.g Fungi (Bread moulds, yeast mushroom)

Parasitic:- Organisms derive nutrition from another living organism (host), often causing harm to the host.

e.g: lice, leech, tapeworm, cascuta (amar-bel)

PHOTOSYNTHESIS:-

The process by which plants make their own food from carbon dioxide and water by using sunlight energy in the presence of chlorophyll is called Photosynthesis.

conditions necessary for photosynthesis:-

A) Sunlight B) Carbondioxide
C) chlorophyll D) Water.

$$6CO_2 + 12H_2O \xrightarrow[\text{sunlight}]{\text{chlorophyll}} C_6H_{12}O_6 + 6H_2O + 6O_2$$
(Glucose)

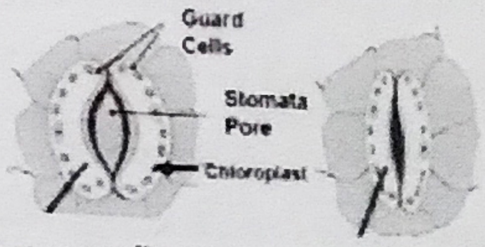
Absorption of light energy by chlorophyll.

conversion of light energy to chemical energy and splitting of water molecules into hydrogen and oxygen.

Reduction of carbon dioxide to carbohydrates.

Site of photosynthesis:- chloroplasts

chlorophyll is present in the green coloured organelles called 'chloroplasts' inside the plant cells. The leaves are green because they contain chloroplasts.

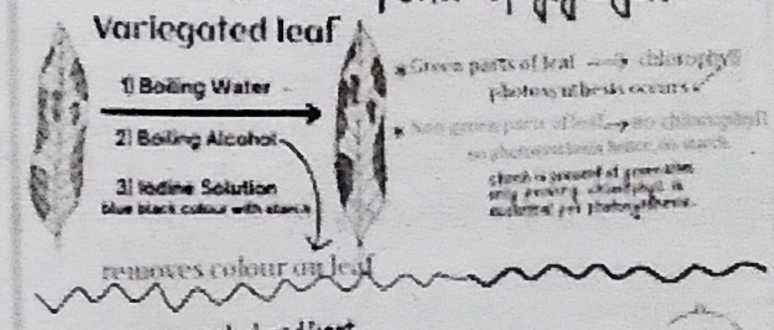


Absorb H_2O: Swell; open H_2O lost, shrink; closed

- CO_2 enters through stomata.
- stomata tiny pores present on the surface of the leaves.

WATER-TAKEN UP BY ROOTS FROM SOIL

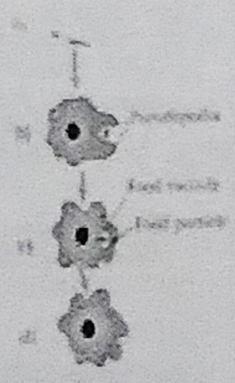
- Nitrogen, phosphorous, magnesium, and iron are also taken.
- Nitrogen is taken in form of nitrates and nitrites.
- Food is stored in the form of starch in plants, In animals stored in the form of glycogen.



Nutrition in AMOEBA

(Unicellular Organism)

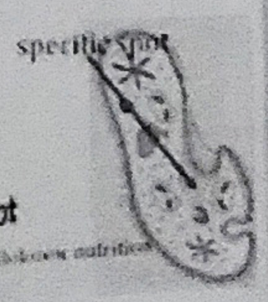
Holozoic nutrition



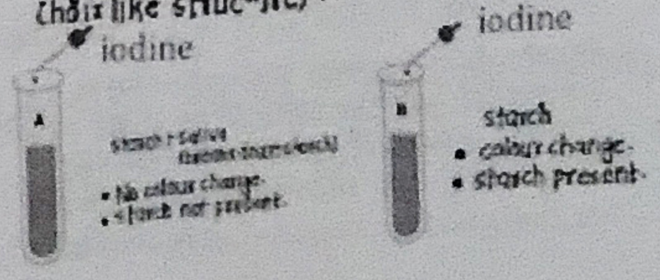
1) Amoeba takes in food using temporary finger like extensions of the cell surface called Pseudopodia.
2) Food Vacuoles- complex substance → simpler substances
3) Absorption of digested food in cytoplasm by diffusion.
4) undigested food: moves to cell surface and thrown out.

Nutrition in Paramecium:-

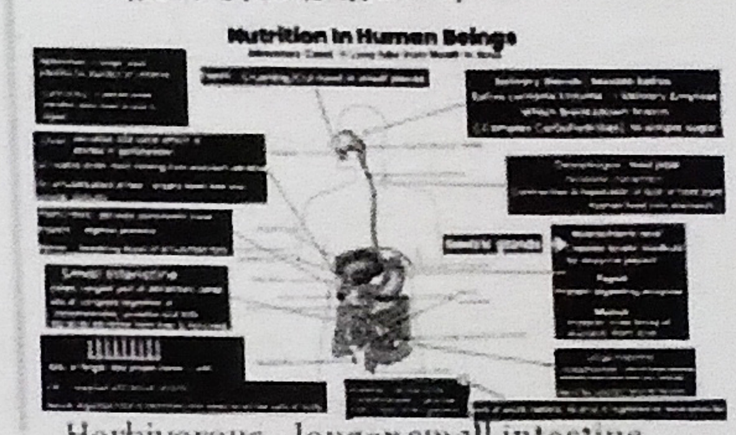
(Unicellular Organism)



1) The cell has a definite shape (like slipper).
2) Food is moved to a specific spot by the movement of cilia (hair like structure).



CONCLUSION:- saliva causes breaks down of starch.



Herbivorous - longer small intestine for digestion of cellulose.
Carnivorous - shorter small intestine since meat is easier to digest.

RESPIRATION

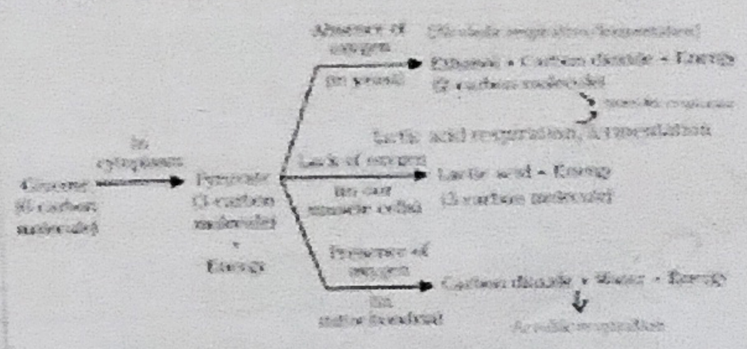
The process of releasing energy from food is called Respiration.

BREATHING

- Physical process
- process of inhaling and exhaling the air.
- No released instead energy is required.
- Happens in lungs.

RESPIRATION

- chemical process.
- process of breaking down of food to produce energy.
- Energy is released in form of ATP
- Happens in cells.



The buildup of lactic Acid in our muscles during sudden Activity causes cramps.

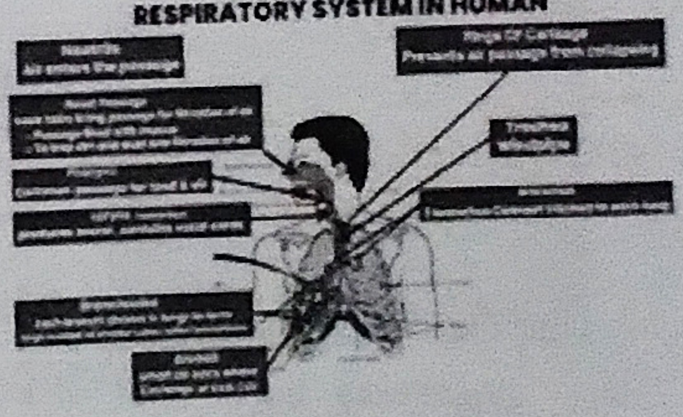
AEROBIC RESPIRATION:-

- oxygen is Required
- More energy produced
- complete oxidation and breakdown of glucose.
- occurs in cytoplasm and mitochondria
- End products: $CO_2 + H_2O$

ANAEROBIC RESPIRATION:-

- oxygen not required.
- less Energy produced
- Incomplete oxidation and breakdown of glucose.
- occurs only in cytoplasm.
- End products: CO_2 + ethanol/lactic acid.

RESPIRATORY SYSTEM IN HUMAN



The diaphragm is a large, dome-shaped muscle that separates the chest from the abdomen.

Residual volume:- Amount of air always remaining in lungs (to provide sufficient time to absorb O_2 and release CO_2)

Haemoglobin:- pigment present in RBCs to carry oxygen.

Inhalation/Inspiration

- Diaphragm contracts.
- Diaphragm moves downward and Becomes flat.
- chest cavity become larger.
- Air is sucked into the lungs.

Exhalation/Expiration

- Diaphragm relaxes.
- Diaphragm moves upward and becomes dome-shaped.
- chest Cavity becomes smaller.
- Air is pushed out from the lungs.

RESPIRATION IN PLANTS

Exchange of gases → occurs through stomata.

DAYTIME:

Photosynthesis → Oxygen produced
Respiration → Carbondioxide is produced.
This CO_2 is used in Photosynthesis
Net Result → O_2 is given out.

NIGHTTIME

No photosynthesis
Respiration → Carbondioxide is produced
Net Result → CO_2 is given out

BREATHING IN FISH

Fish → take in water through Mouth
↓
Force it past the gills
↓
dissolved O_2 is taken by blood

Terrestial Organisms	Aquatic Organisms
• Breathe oxygen in atmosphere	• Use dissolved oxygen in water.
• Rate of breathing is less	• Rate of breathing is more.

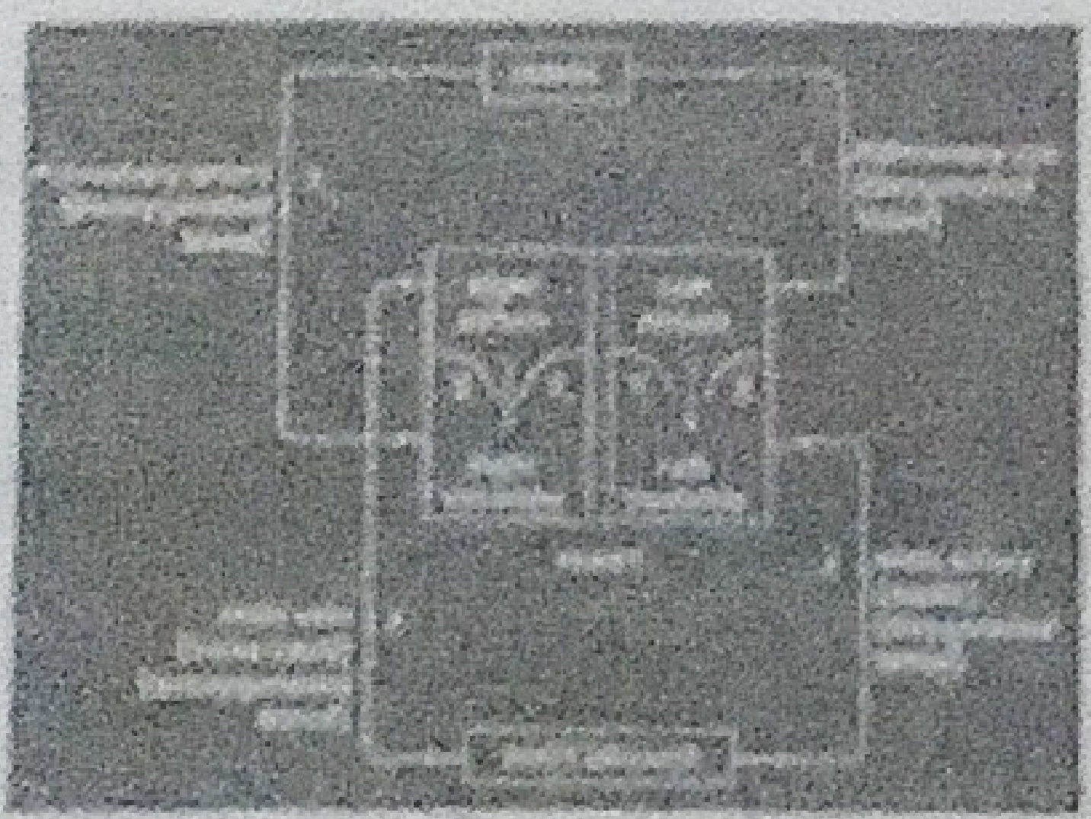
TRANSPORTATION IN HUMANS

The process of transfer of substances from one part of the body to other parts.
* circulatory system
* lymphatic system

The circulatory system consists of the heart, blood and blood vessels (lord a artery a away)

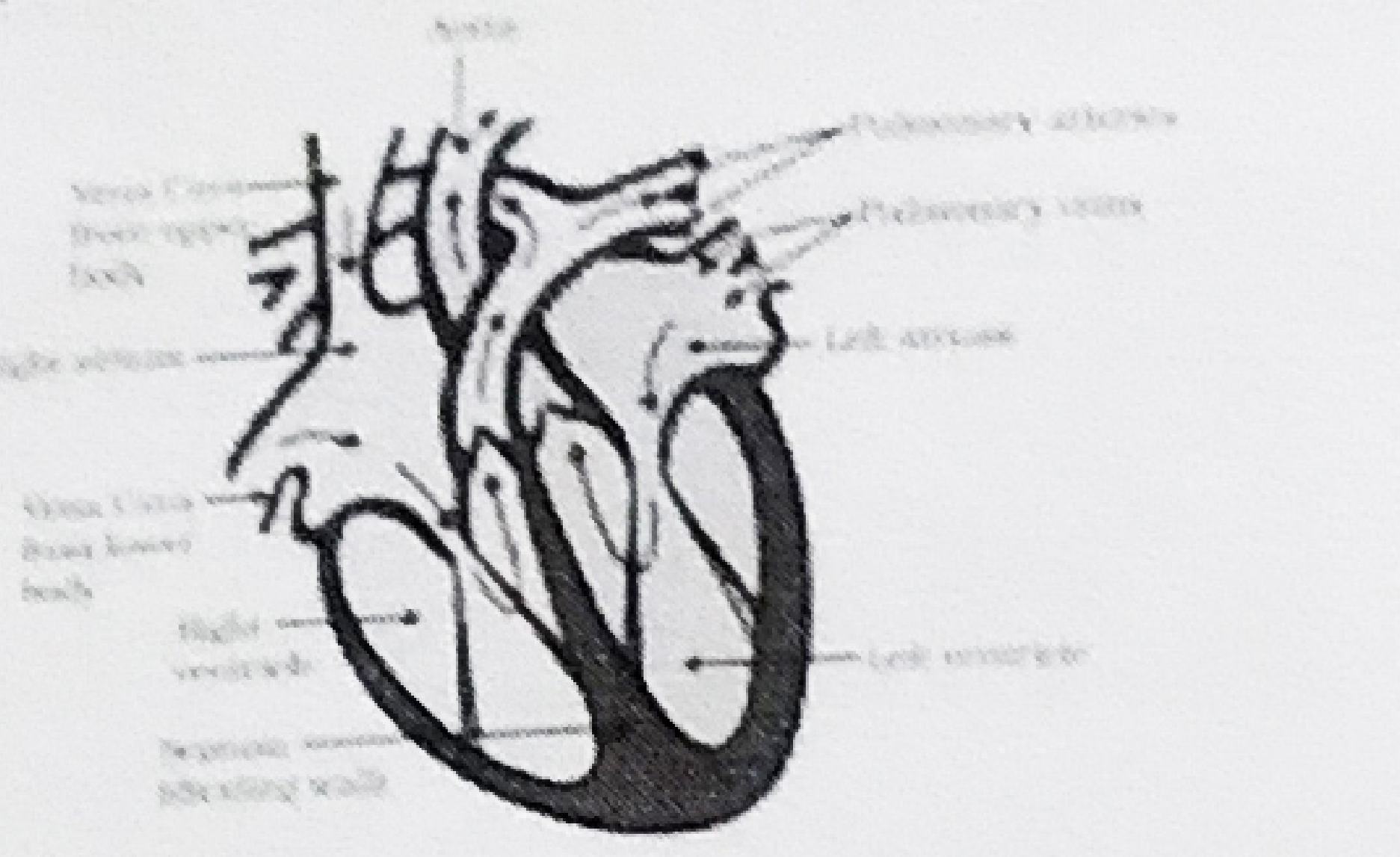
HEART

The heart is a muscular organ that is as big as our fist.



Largest artery - Aorta
Largest vein - Vena cava

- septum separates heart's chambers and prevents the mixing of oxygenated and deoxygenated blood.
- Ventricles have thicker walls than atria to withstand high pressure of blood

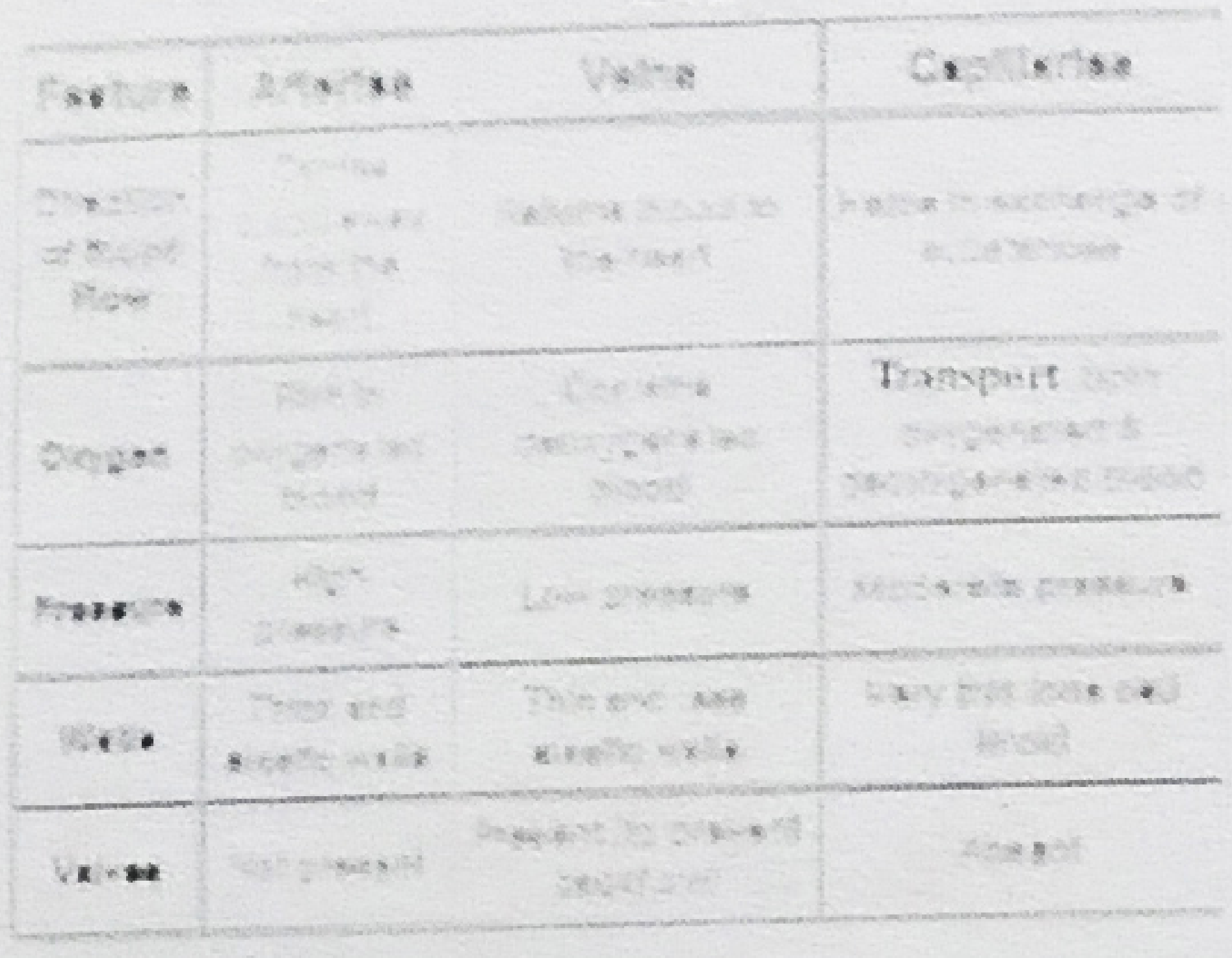


Arteries - carry oxygenated blood away from heart.

Veins - Carry deoxygenated blood to the heart.

Pulmonary Artery - carries deoxygenated blood.

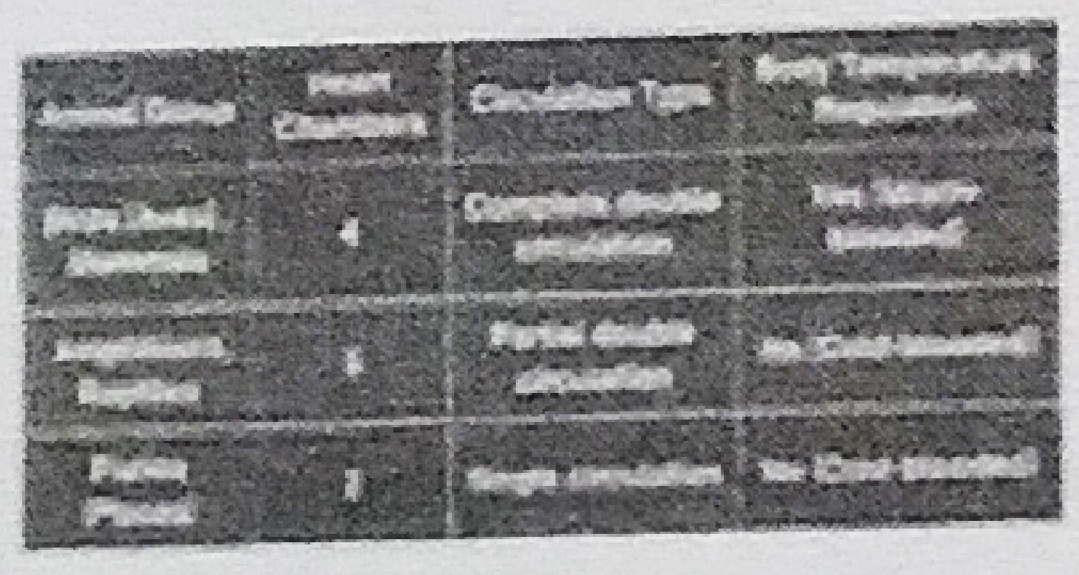
Pulmonary Vein - carries oxygenated blood.



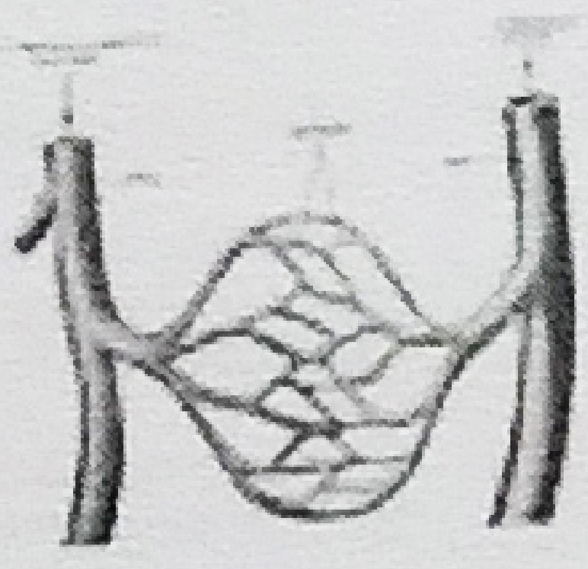
Feature	Arteries	Veins	Capillaries
Direction of Blood Flow	Carries blood away from the heart	Returns blood to the heart	Helps in exchange of substances
Oxygen	Rich in oxygenated blood	Contains deoxygenated blood	Transport both oxygenated & deoxygenated blood
Pressure	High pressure	Low pressure	Moderate pressure
Walls	Thick and elastic walls	Thin and less elastic walls	Very thin (one cell thick)
Valves	Not present	Present to prevent backflow	Absent

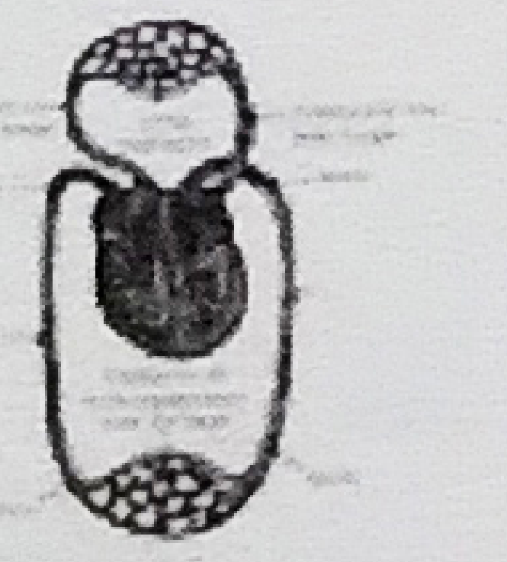
Exception -
Pulmonary artery - carries deoxygenated blood.
Pulmonary vein - carries oxygenated blood.

Valves are present in veins to prevent backflow of blood



Animal Group	Heart Chambers	Circulation Type	Body Temperature Regulation
Birds (Aves), Mammals	4	Complete double circulation	Yes (Warm-blooded)
Amphibians, Reptiles	3	Partial double circulation	No (Cold-blooded)
Fishes (Pisces)	2	Single circulation	No (Cold-blooded)





Single Circulation:-
Blood passes only once through the heart in a complete cycle.

Double Circulation:-
Blood flows twice through the heart before completing a full circuit.

BLOOD COMPONENTS:-

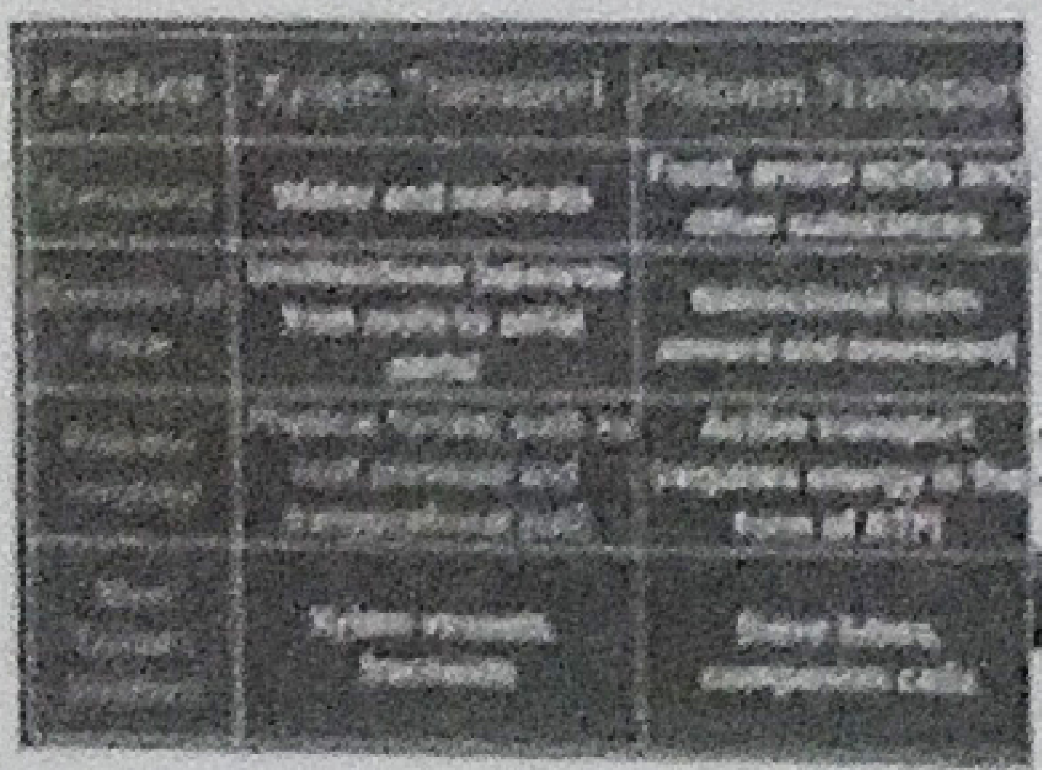
RBCs: Contain haemoglobin and transport oxygen.
WBCs: Fight infections, produce antibody to kill pathogens.
Platelets: clotting of blood.
Plasma:- Fluid medium, transport food, carbon dioxide & nitrogenous waste.

LYMPH or TISSUE FLUID

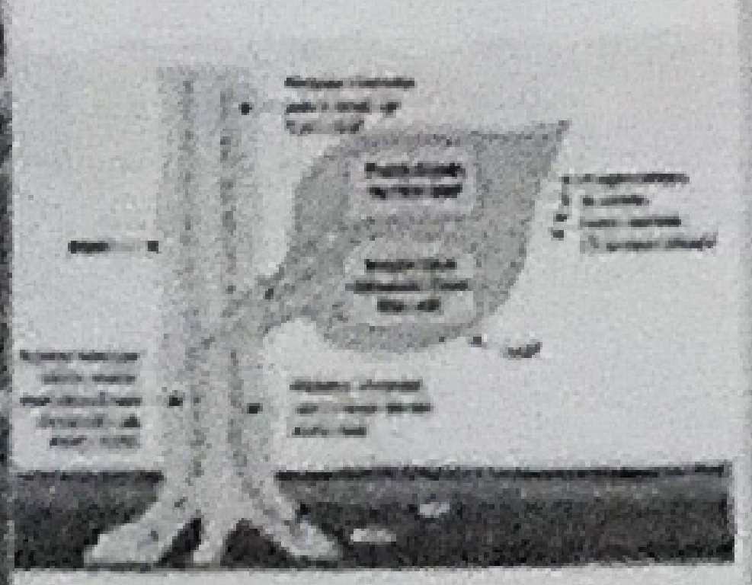
- Lymph is a part of lymphatic system
- formed from leaked components of blood (plasma, proteins and bloodcells) through pores in walls of capillaries.
- colourless fluid.
- Contains less protein than blood.
- Carries digested and absorbed fat from intestine.
- Drains excess fluid back into the blood.

TRANSPORTATION IN PLANTS

Xylem and Phloem are independent conducting tubes.



Feature	Xylem Transport	Phloem Transport
Transports	Water and minerals	Food, amino acids and other substances
Direction of Flow	Unidirectional (upwards) from roots to aerial parts	Bidirectional (both upward and downward)
Process Involved	Physical forces, such as root pressure and transpirational pull	Active transport, requires energy in the form of ATP
Main Conducting Elements	Xylem vessels, tracheids	Sieve tubes, companion cells



Plants do not move and have a large proportion of dead cells in many tissues. Hence they have low energy needs and use slow transport systems. but, transportation distance can be very large.

Transport of water

Root pressure - Roots take up ions from soil which creates difference in the concentration of these ions. water from soil moves into the roots. there is a constant movement of water into root xylem and water is steadily pushed upwards.

Transpiration - The loss of water in the form of vapour from the aerial parts of the plant is called transpiration.

Transpiration helps in
- Absorption and upward movement of water and minerals from roots to leaves.
- temperature Regulation

Daytime - Major force is transpirational pull
Night time - Root pressure

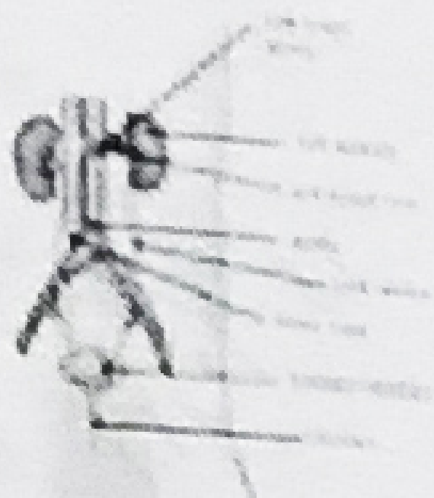
Transport of food
Translocation

- The transport of food prepared in leaves to other parts of the plant is called translocation.
- Phloem translocates the food made in the leaves.
- These substances are especially delivered to the storage organs of roots, fruits & seeds & to growing organs.

EXCRETION IN HUMAN BEINGS

Removal of harmful metabolic wastes from the body is called Excretion.

The excretory system of human beings include -



Kidney:- Nitrogenous waste such as urea and uric acid are removed from blood through kidneys.

A pair of ureters:- connects the kidneys with the urinary bladder

Urinary bladder:- urine is stored in urinary bladder until it is passed out (muscular, under nervous control)

Urethra:- Transport urine out of the body

Nephron is the structural and functional unit of kidney. Each kidney has large number of nephrons.

Glomerulus - cluster of blood vessels
Bowmans Capsule - cup shaped structure in kidney that surrounds glomerulus and collects the filtrate.

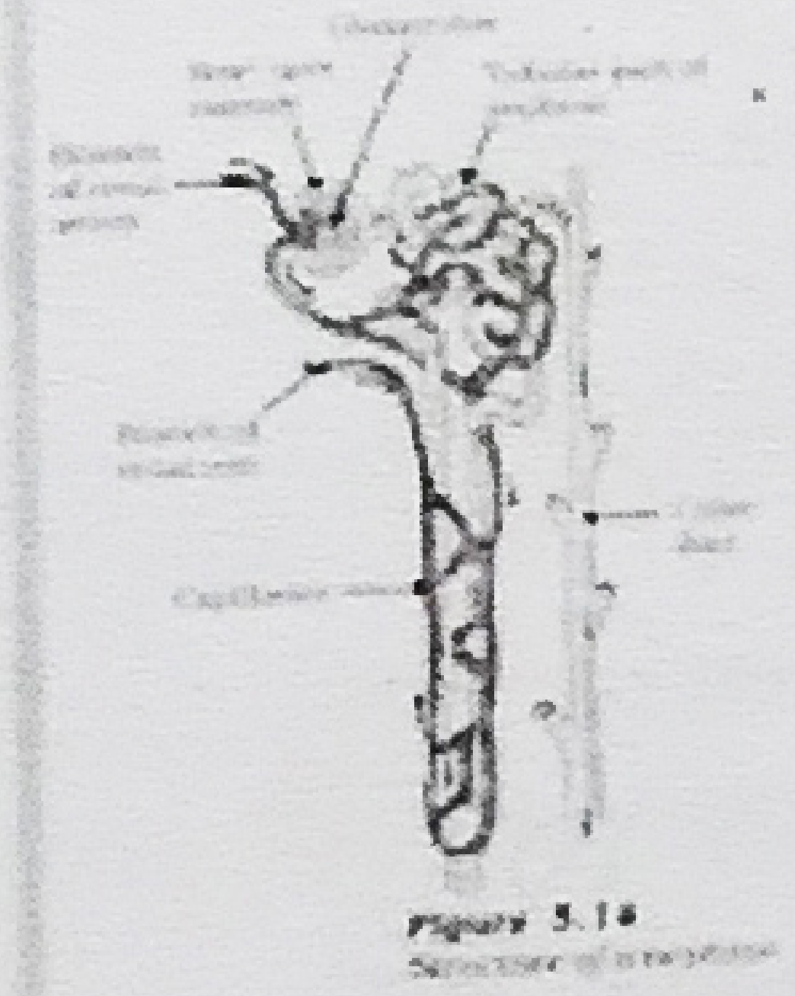
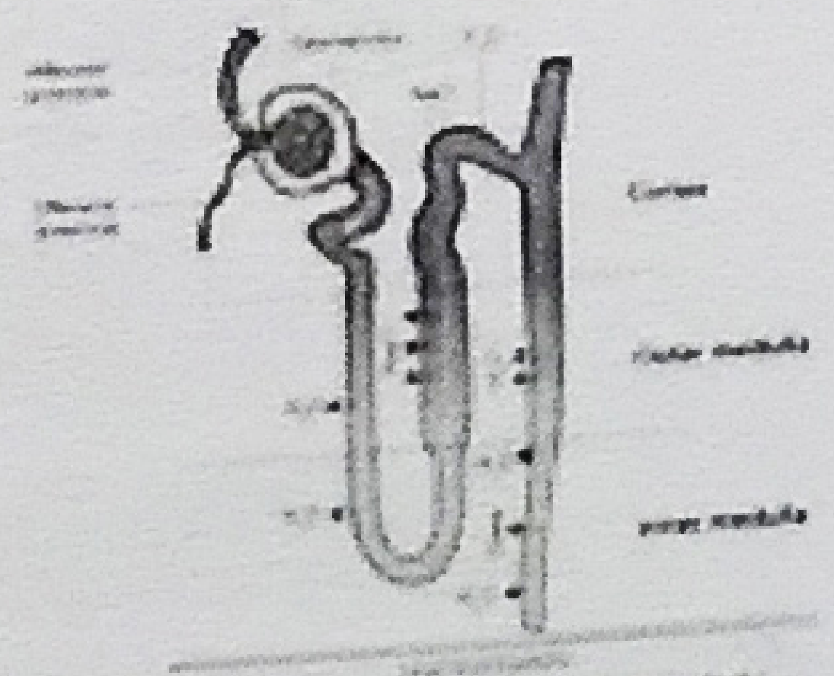


Figure 5.14
Structure of a nephron

Glomerular Filteration:-
- Nitrogenous wastes, glucose, water, amino acids, excessive salts from the blood are filtered and initial filterate enters into Bowman capsule of the nephron.

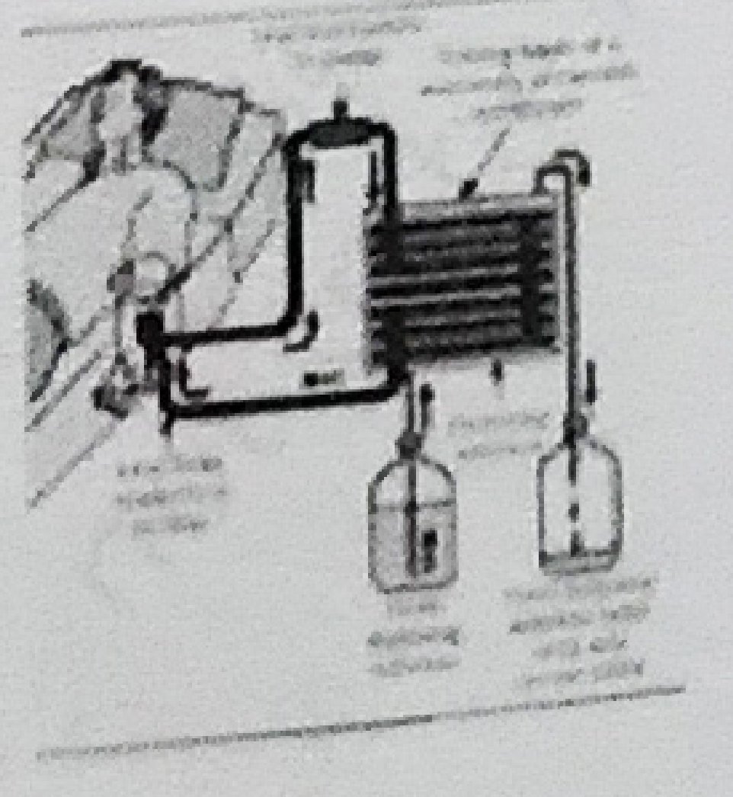
Selective Reabsorption:-
- Useful substances like glucose, amino acids, salts and a major amount of water from the filterate are reabsorbed back by capillaries surrounding the nephron.
- Urea, extra water and salts are secreted into the tubule which open up into the collecting duct and then into the ureter.

Tubular secretion - urea, extra water & salts are secreted into the tubule which open up into the collecting duct & then into the ureter.



Amount of water reabsorbed depends on
1) Amount of excess water in body
2) Amount of dissolved waste to be excreted.

ARTIFICIAL KIDNEY
(HEMODIALYSIS)



- In case of kidney failure, an artificial kidney can be used.
- An artificial kidney removes nitrogenous waste products from the blood through dialysis.
- Artificial kidney → No Reabsorption involved
- Dialyzing fluid → same osmotic pressure as blood (without nitrogenous wastes)
- Used dialyzing solution → rich in urea and excess salts

Excretion in plants:-

- Oxygen and carbon dioxide is diffused through stomata.
- Excess water is removed by transpiration.
- Shedding of old leaves and bark.
- Many plant waste products are stored in cellular vacuoles
- Plants also secrete some waste substance into the soil around them.

CURRENT YEAR QUESTIONS [CYQs]

LIFE PROCESSES

QUESTION-1)(a) What is photosynthesis? identify the organelle and the organs where it occurs, explain the process using the balanced equation, and state the source of the oxygen released durning this process.
(b) How would you design an experiment to demonstrate that carbon dioxide is essential for photosynthesis, and what would be the expected observation and conclusion?
CBSE (2021, 2022, 2023, 2024)

QUESTION-2) (a) What is the name of the enzyme found in the fluid of our mouth cavity, and which gland produces it? Explain the action of saliva on food with help of an activity.
by-1 (b) Name the type of Nutrition exhibited by Ameoba. Explain how food is taken in and digested by this Organism. CBSE (2023, 2024)

QUESTION-3) (a) What is the role of each of the following in the human digestive system.
(i) Hydrochloric acid (ii) Villi (iii) Anal sphincter (iv) Lipase (v) Mucus (vi) Bile Juice (vii) Trypsin.
(b) How is the absorption of digested food carried out in the small intestine, and Why is it necessary?
(c) Why is the small intestine longer in herbivores than in carnivores?
CBSE (2020, 2023, 2024)

QUESTION-4) state reasons for the following.
(i) sometimes while running, the athletes suffer from muscle cramps.
(ii) The lungs are designed in human beings to maximize the area for exchange of gases.
(iii) Rate of breathing in acquatic organisms is much faster than that in terrestrial organisms.
(iv) In human beings, when air is taken into the body through the nostrills and passed through the throat, the air passage does not collapse.
(v) The test tube containing lime water turns milky when we exhale.
CBSE (2021, 2021, 2022, 2024)

QUESTION-5) (a) Draw a flow chart showing the three different pathways involved in the breakdown of glucose and specify anaerobic and aerobic respiration in it.
(b) Draw a diagram of the human respiratory system and label - pharynx, trachea, lungs, diaphragm and alveolar sac on it.
CBSE (2015, 2020)

QUESTION-6) The states reasons for the following.
(i) The muscular walls of the ventricles are thicker than those of the atria.
(ii) The transport system in plants is relatively slow.
(iii) Circulation of blood in acquatic vertebrates differs from that in terrestial vertebrates.
(iv) Durning the day, water and minerals move more quickly through the xylem compated to at night.
(v) When we are injured and start bleeding, it stops after some time.
(b) (i) Differentiate between arteries, veins and capillaries in terms of composition and functions.
(ii) Explain and draw a well labelled diagram showing double circulation in human beings and trace the path of oxygenated and deoxygenated blood in arteries and veins respectively?
CBSE (2020, 2021, 2022, 2023, 2024)

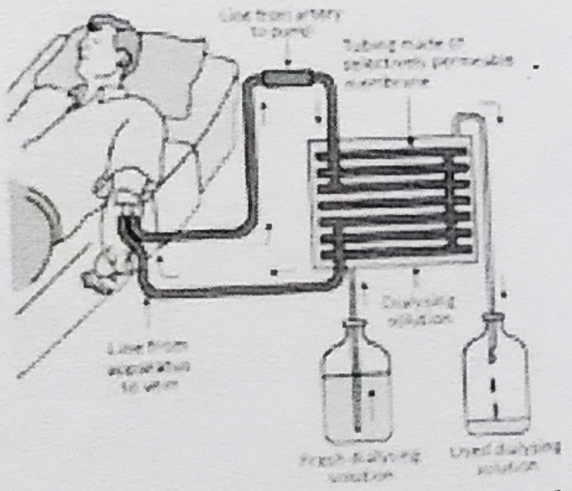
QUESTION-7) (a) Draw a well labelled diagram of the human heart showing their chambers, septum and circulation of blood in it.
(b) What is lymph and how does it differ from blood?
(CBSE 2022, 2024)

QUESTION-8) (a) Draw a neat diagram of the human excretory system and label following parts and states their functions respectively.
(i) Urethra (ii) Kidney (iii) Ureter
(b) Describe the structure of the basic filteration unit present in the kidney.
(c) Explain in brief two ways by which leaves of a plant help in excretion
CBSE (2019, 2020, 2021, 2022, 2023)

QUESTION-9) Read the following and answer the questions.
In case of kidney failure, an artificial kidney can be used. An artificial kidney is a device to remove waste products from the blood through dialysis.
(a)(i) Name the artery that brings oxygenated blood to the kidney.
(ii) Name the cluster the thin-walled blood capillaries present in the Bowman's capsule.
(b) In human excretory system name the organ which stores urine. Is this organ under hormonal control or nervous control?
(c)(i) List two major steps involved in the formation of urine and state in brief their functions.
(ii) In which part of the nephron does selective reabsorption take place? List the factors which the amount of water from urine reabsorbed depends on.
CBSE (2021, 2022, 2024) CBQ

QUESTION-10) Read the following and answer the Questions.
During haemodialysis, the patient's blood is cleaned by filtration through a series of semi-permeable membranes before being returned to the blood of the patient.

(i) The haemodialyser has semi-permeable lining of tubes which help
(a) to maintain osmotic pressure of blood
(b) to filter nitrogenous wastes from the dialysing solution.
(c) in passing the waste products in the dialysing solution
(d) to pump purified blood back into the body of the patient.



(ii) Which one of the following is not a function of artificial kidney?
(a) To remove nitrogenous wastes from the blood.
(b) To remove excess fluids from the blood.
(c) To reabsorb essential nutrients from the blood.
(d) To filter and purify the blood.
(iii) The 'used dialysing' solution is rich in
(a) urea and excess salts
(b) blood cells
(c) lymph
(d) proteins
(iv) Which part of the nephron in the human kidney serves the function of reabsorption of certain substances?
(a) Glomerulus
(b) Bowman's capsule
(c) Tubules
(d) collecting duct
CBSE (2020, 2021, 2022) CBQ

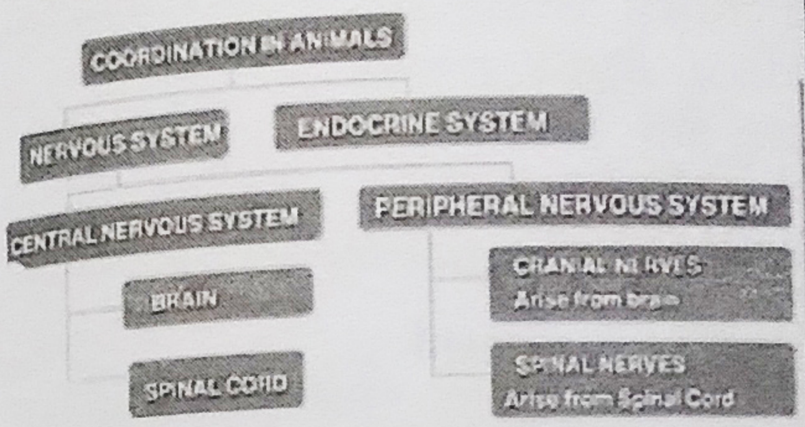
ALAKH SIR ke FARREY

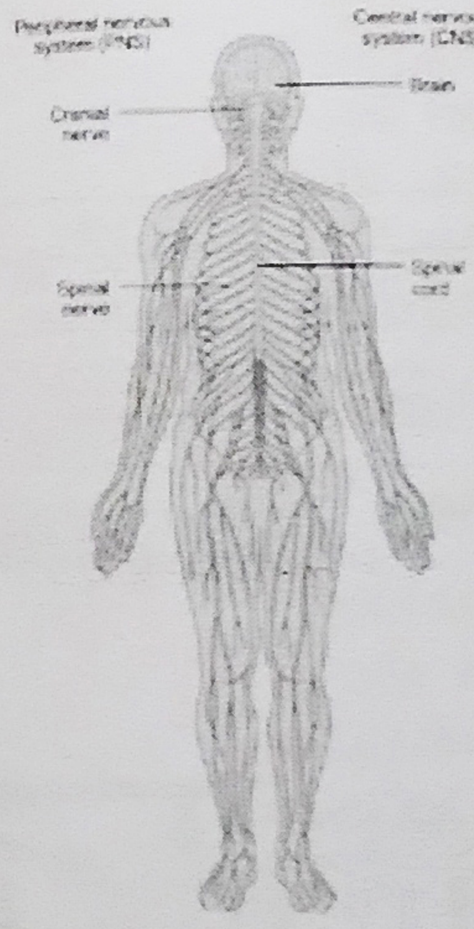
Control & Coordination

stimuli - change in the environment to which an organism responds.

Response - Reaction of an organism to a stimulus.

Working together of various parts of body to respond to a stimuli is called Coordination.





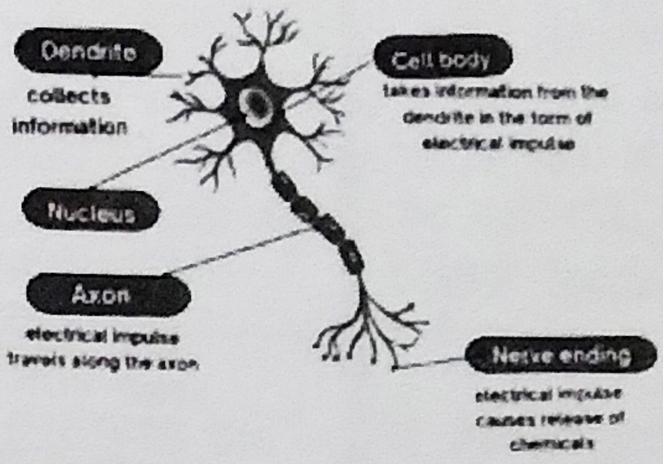
Nervous Tissues :- • made up of a organized network of nerve cells.
- Bundle of neurons.

Receptors :- cells, tissue or organs that receive the stimulus.

Effectors :- muscles/tissues/glands which act in response to a stimuli.

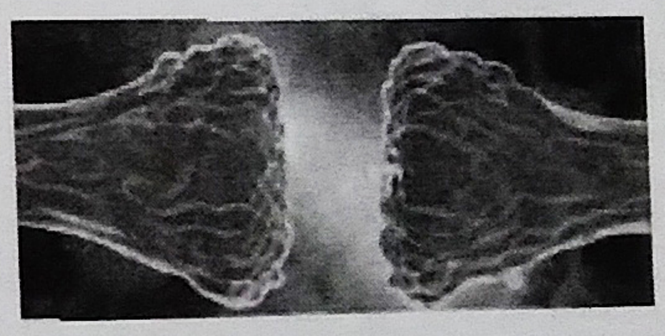
Receptor	Sense Organ	Stimuli
Photo receplors	Eyes	Light
Olfactory receptors	Nose	Smell
Gustatory receptors	Tongue	Taste
Phono receptors	Ear	Sound
Thermoreceptors	Skin	Heat/ Cold
Nociceptors	Skin	Pain

NEURON :-
- structural and functional unit of nervous system.
- largest cell in Body.
- Carry messages in the form of electrical impulsec.



TRANSMISSION OF IMPULSE BETWEEN 2 NEURONS

Receptors receive the stimulus
↓
Information is collected at the end of dendritic tip.
↓
chemical Reaction creates an electrical impulse
↓
Impulse travel from dendrite to cell body.
↓
Impulse travels through the axon.
↓
Reaches nerve endings
↓
Release of chemicals at the synapse



SYNAPSE :- Microscopic junction between two neurons.

- There is a release of chemical substances at the synapse between two neurons which help in the transmission of electrical impulse.

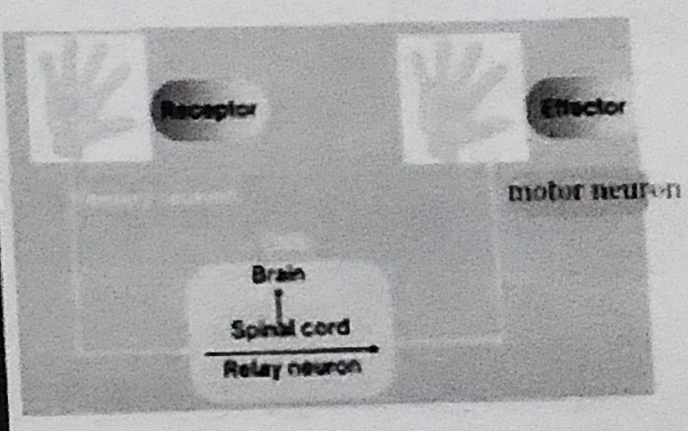
Neurotransmitters :- chemical substances that help in the transmission of nerve impulse.

NEUROMUSCULAR JUNCTION :-
- Junction between nerve ending of a motor neuron and a muscle.

presence of stimulus
↓
Receptors receive the stimulus
↓
Impulse taken by sensory neurons
↓
conduction of impulse through the neurons
↓
Information reaches to CNS
↓
Relay neurons present in CNS transfers impulse from sensory to motor neurons
↓
Motor neurons carry information from CNS to effectors
↓
Effectors (muscles/glands) respond to stimuli.

TYPES OF NEURONS

- **Sensory Neurons** — Transmit impulse from Receptor to CNS.
- **Motor Neurons** — Transmit impulse from CNS to effectors (muscle or gland)
- **Relay Neurons** — Connects sensory and Motor neurons.

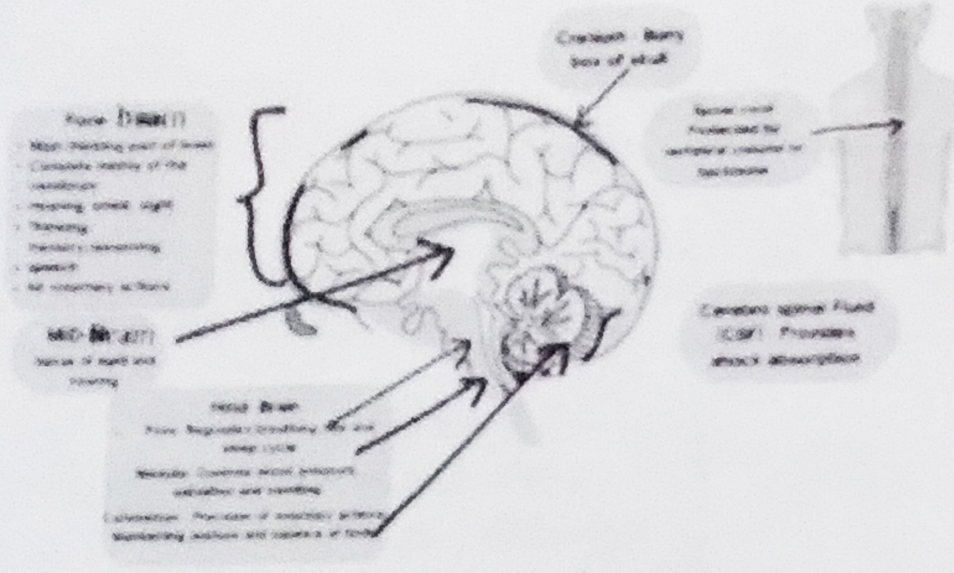


REFLEX ACTIONS (Reflex Movement)
- sudden and Quick movement.
- Involuntary movement.
- Brain not involved (directly not involved)
- Reflex actions are controlled by spinal cord.

Type of Action	Description	Examples
Voluntary Actions	- Controlled by will- Thinking and brain involved	Walking, Writing, Dancing
Involuntary Actions	- Uncontrolled- No thinking Brain involved	Blood pumping, Peristalsis
Reflex Actions	- Uncontrolled- No thinking- No brain involved	Hand withdrawal, Sneezing

Reflex Arc :- Path followed by nerve impulse during reflex action.

BRAIN :-
- CNS → Brain + spinal cord
- Main coordinating center of the body.



HORMONES IN ANIMALS

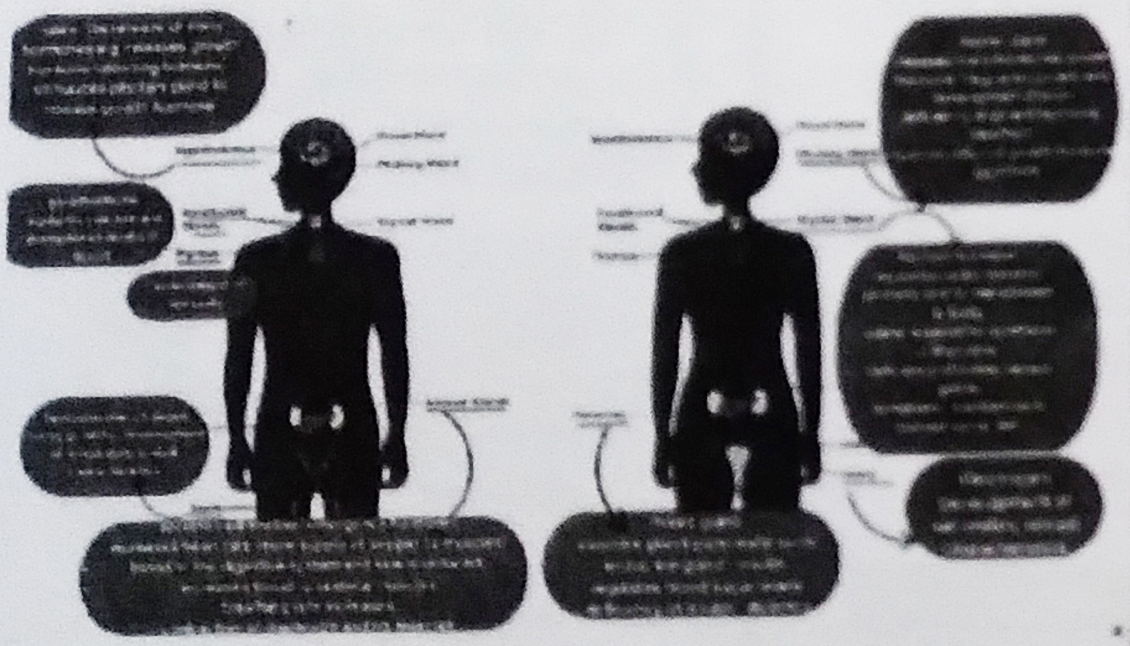
Hormones- chemical substances that act like messenger molecules in the body

Gland- a structure that secretes a specific substance.

Types of Glands

(1) Endocrine- ductless glands, secrete products directly into the bloodstream

(2) Exocrine - have ducts.



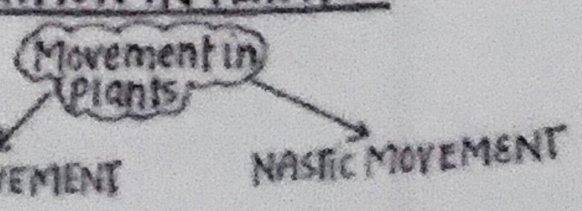
Gland	Hormone	Function	Related disease
Hypothalamus	Releasing hormones	Stimulates pituitary gland to release hormones	
Pituitary gland	Growth hormone	Body growth, development of bones & muscles	Excess - Gigantism Deficiency - Dwarfism
Thyroid gland	Thyroxine	Regulates carbohydrate, protein & fat metabolism	deficiency of thyroxine - Goitre
Pancreas	Insulin	Control blood sugar levels	Diabetes
Adrenal gland	Adrenaline	Prepare body to cope with emergency situations	
Testes in males	Testosterone	Development of secondary male characters like deep voice, beard, and sex organs	
Ovaries in females	Oestrogen	Development of secondary female characters like mammary glands, menstrual cycle and sex organs	

- feedback mechanism- the timing and amount of hormone released are regulated by feedback mechanism.

e.g.

- Blood sugar levels increase - pancreas produces more insulin.
- Blood sugar levels decrease - insulin secretion is reduced.

COORDINATION IN PLANTS :-



TROPIC MOVEMENT :-

- Tropic Movement - growth dependent
- growth movement of a plant part in response to external stimuli is called tropism.
- direction of stimulus determines the direction of response.
- Growth of plants towards stimulus → positive tropism.
- Growth of plants away from stimulus → Negative tropism.

Phototropism	Growth response to light	+ Shoots are positively phototropic, they grow towards light + Roots are negatively phototropic, they grow away from light	+ The cells on the shaded side of shoots elongate more than cells on the lighted side, causing shoots to bend towards light + The cells on the shaded side of roots elongate more than cells on the lighted side, causing roots to bend away from light
Geotropism	Growth response to gravity	+ Roots are positively geotropic, they grow towards gravity + Shoots are negatively geotropic, they grow away from gravity	+ Cells on the lower side of roots elongate more than cells on the upper side, causing roots to bend towards gravity + Cells on the lower side of shoots elongate more than cells on the upper side, causing shoots to bend away from gravity
Hydrotropism	Growth response to water	+ Roots are positively hydrotropic, they grow towards water	+ Cells on the side of roots nearer to water elongate more than cells on the side further from water, causing roots to bend towards water
Chemotropism	Growth response to chemicals	+ Pollen tubes are positively chemotropic, they grow towards chemicals released by ovules	+ Cells on the side of pollen tubes nearer to chemicals elongate more than cells on the side further from chemicals, causing pollen tubes to bend towards chemicals
Thigmotropism	Growth response to touch	+ Tendrils are positively thigmotropic, they grow towards objects they touch	+ Cells on the side of tendrils further from objects they touch elongate more than cells on the side nearer to objects they touch, causing tendrils to bend towards objects they touch

NASTIC MOVEMENT :-

- Non-directional movement in plant in response to stimuli.
- Growth independent movement.

e.g. When we touch the leaves of a sensitive plant like Mimosa pudica, they fold.

Characteristic	Tropic Movements	Nastic Movements
Response to Stimulus	Unidirectional Response to Stimulus	Non-directional Response to Stimulus
Dependency on Growth	Growth dependent movements	Growth independent movements
Nature of Movement	Permanent and irreversible	Temporary and reversible
Occurrence in Plants	Found in all plants	Found only in a few specialised plants
Speed of Movement	Slow action	Immediate action

ANIMALS	PLANTS
Specialised tissues for conduction of information	No specialised tissues for conduction of information
They change shape because of specialised proteins in muscles	They change shape because of changes in amount of water in cells (swelling & shrinking)

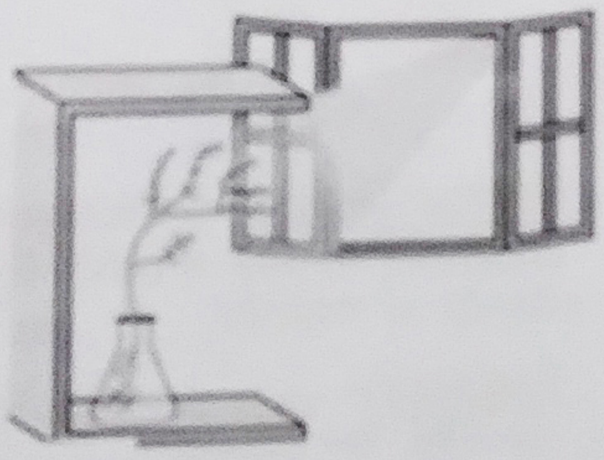
HORMONES IN PLANTS

Auxins - promotes cell enlargement and cell differentiation.
promotes fruit growth.
Auxin is made by cells at the tip of stems and roots.
moves away from light and moves towards gravity.

CYTOKININS - promotes cell division.
present in greater concentration in areas of rapid cell division (such as fruits and seeds)

GIBBERELLINS - help in growth of the stem

ABSCISIC ACID :-
- growth inhibitor
- falling of leaves



BENDING OF PLANT :-

light comes on one side of plant.
- Auxin diffuses toward shady side of shoot.
- Cells grow longer on the side of shoot away from light.
- Thus plant appears to bend towards light.

CONTROL AND COORDINATION
(CYQ)

Question-1) (i) What is meant by receptors in the human body?
(ii) Name any four types of receptors with their locations.
(iii) Why is chemical coordination better than electrical impulses for communication in multicellular organism? (CBSE 2018, 2020, 2023, 2024)

Question-2) Draw a diagram of neuron and label its parts.
(i) where information is acquired,
(ii) through which information travels as an electric impulse, and
(iii) where the electric impulse must be converted into a chemical signal for onward transmission. (CBSE 2018, 2019)

Question-3) (i) identify which parts of the brain are responsible for
(a) maintaining posture and balance.
(b) Controlling heartbeat.
(c) enabling thinking
(d) Regulating blood pressure.
(ii) Explain how the brain and spinal cord are protected from shocks and injuries.
(iii) What constitutes the central and peripheral nervous systems?
(CBSE 2020, 2023)

Question-4) CBSE
Ravi accidentally touches a hot pan while cooking and immediately pulls his hand away. This rapid response saves him from a severe burn.
(i) Define a reflex action. Using a flowchart, illustrate the path of the reflex action Ravi experienced when he touched the hot pan.
(ii) Why are reflex arcs considered more efficient for quick response and why have they evolved in animals like humans?
(iii) Describe the role of sensory and motor neurons in this reflex arc.
(CBSE 2024)

Question-5)
(i) Define geotropism. Draw a well-labeled diagram of a plant showing geotropic movement of its parts. What is meant by positive and negative geotropism?
(ii) Name a plant hormone responsible for bending of a shoot towards unidirectional light. How does it promote phototropism?
(iii) How do auxins promote the growth of a tendril around a support?
(CBSE 2019, 2020)

Question-6) (i) The leaves of 'chhui-mui' plant begin to fold up and droop in response to a stimulus. Name the stimulus and write the cause for such a rapid movement. Is there any growth involved in the movement?
(ii) state the types of movements seen in plants due to water and chemical stimulus and explain with the help of diagrams respectively.
(CBSE 2016, 2024)

Question-7) (i) Where is the thyroid gland located in the human body? Name the hormone secreted by the thyroid gland and explain its function.
(ii) What is hypothyroidism? How can it be managed? What dietary changes can help regulate TSH levels?
(iii) What hormone is secreted by the adrenal gland durning stressful situtions. and What are three responses the body exhibits when this hormone is released into the blood?
(CBSE 2020, 2023, 2024)

Question-8) CBQ

Rahul, a 14 year-old boy, has been experiencing abnormal growth patterns. His parents are concerned as he is much shorter than his peers. The doctors conducts a series of tests and finds that he has a deficiency of a particular hormone responsible for growth regulation. Meanwhile, his grandfather has been advised to reduce sugar intake due to high blood glucose levels.

(i) What disease is Rahul's grandfather likely experiencing? identify the hormone and the gland responsible for the imbalance.
What hormone deficiency is Rahul likely facing which gland secretes it and how does it impact growth regulation?
How does the timing and amount of hormone release get regulated in the body? Explain with an example.
(CBSE 2016, 2018, 2020)

ALAKH sir ke FARREY

How do Organisms Reproduce

REPRODUCTION:-

- Reproduction is the process by which living organism produce new individuals of the same species.

KYU ZAROORI HAI?

it ensures the continuity of a particular species on earth.

VARIATION:-

Variations are the differences present between the individuals of the same species.

Importance of variation:-

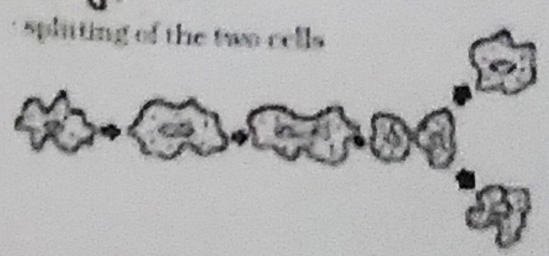
- Variation helps organisms to adopt to the changing environment.
- variation provides stability to a species and thereby helps in evolution.
- Variation in DNA results in the varieties of a species and formation of new species.

ASEXUAL REPRODUCTION:-

✓single parent is involved.
✓No gamete formation.
✓No fertilisation.
✓offsprings formed are usually genetically similar.

Fission:-

- unicellular organisms - celldivision (fission)
- Amoeba - unicellular organism
- Binary fission in amoeba.
- splitting of cells can take place in any plane.

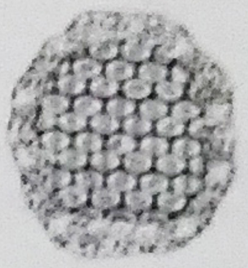


Binary fission in Amoeba

- Leishmania - unicellular organism.
- has a whip-like structure at one end of cell.
- Binary fission occure in fixed plane (in relation to whip-like structure) - longitudinal fission)
- causes Kala-azar.

Binary fission in Leishmania

- Plasmodium - unicellular organism
- divides by multiple fission.
- malarial parasite.



multiple fission in plasmodium

FRAGMENTATION:-

- multicellular organism - spirogyra
- breaks into smaller pieces upon maturation.
- These pieces (fragments) grow into new individuals.

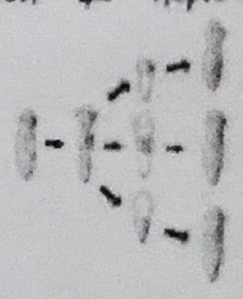
Regeneration:-

if the individual is cut or broken up into many pieces, many of these pieces grow into separate individuals.

e.g Hydra and planaria (multicellular organisms)

- carried out by specialized cells
- regenerated cells proliferate and make a large number of cells.
- occurs in an organized sequence

Regeneration ≠ Reproduction

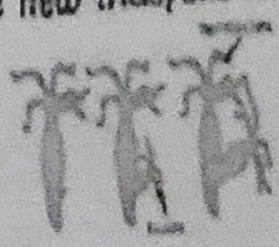


planaria

Budding:-

e.g Hydra, yeast

- Hydra - use regenerative cells for reproduction.
- a bud develops as an outgrowth due to repeated cell division at one specific site.
- Buds develops into tiny individuals detach from the parent body on maturation.
- become new independent individuals



hydra

Vegetative propagation:-

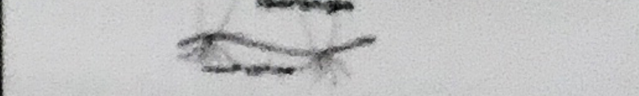
parts like roots, stems, and leaves develop into new plants.

Advantages -

Used in layering or grafting to grow plants like sugarcane, roses, grapes bear fruits and flowers earlier than those produced from seeds.

Propagation of plants that have lost the capacity to produce seeds (Banana, Orange, rose, and jasmine)

plants produced are genetically similar enough to the parent plant to have its characteristics.



Buds produced in the notches along the leaf margin of Bryophyllum fall on the soil and develop into new plants.

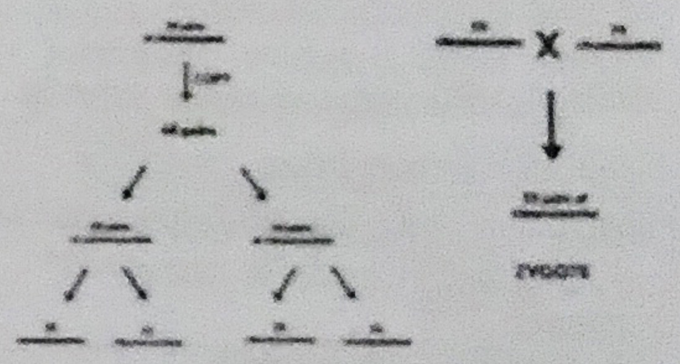
Spore formation:-

Rhizopus (bread mould) - multicellular organism.

- threadlike structure - hyphae
- blob on a stick structure - sporangia
- spores develop into new individuals
- covered by thicks walls that protects them in unfavourable conditions
- favourable condition - moist surface spores begin to grow)

SEXUAL REPRODUCTION:-

✓Two parents are involved
✓Gamete formation occurs.
✓fertilisation occurs
✓offsprings formed are genetically dissimilar.



Sexual Reproduction in flowering plants:-

Pollination - transfer of pollen grains from anther to stigma of a flower

✓ male reproductive part - stamens (produces pollen grains)
✓ female reproductive part - pistil
✓ unisexual flowers - contain either stamen or pistil (papaya or cucumber)
✓ bisexual flowers - contains both stamen and pistil (hibiscus, mustard)

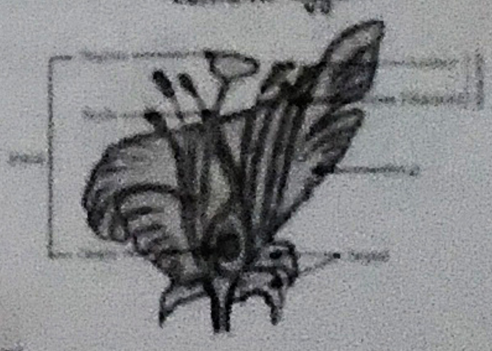
Self pollination - Transfer of pollen in the same flower.

Cross-pollination - Transfer of pollen from one flower to another

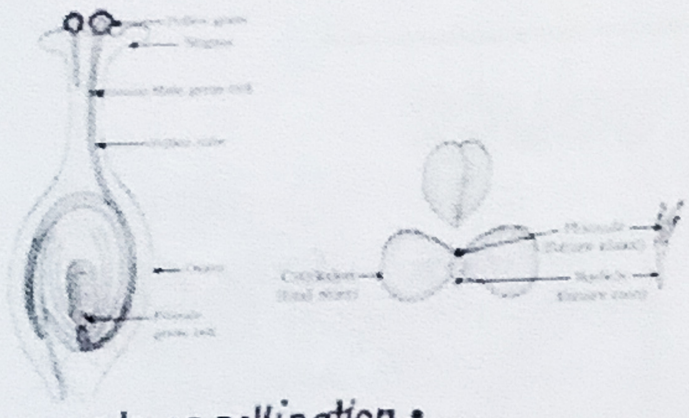
PISTIL

- stigma - sticky terminal part
- stigle - middle elongated
- ovary - swollen part (basal part)

OVARY → contains ovules → contains eggcell



Germination - development of seed into seedlings under appropriate conditions.



Agents of pollination :-

wind, water, animals

pollen lands on stigma

↓

a tube grows out of the pollen grain.

↓

male germ cell + female gamete

↓ fertilisation

zygote

↓ division in zygote

Embryo (within ovule)

- zygote → embryo
- ovule → seed
- ovary → fruit
- petals, sepals, stamen, style shrivel and fall off

SEXUAL REPRODUCTION IN HUMAN BEINGS

sexual maturation of the Body:-

Adolescence - the phase of life between childhood and adulthood.

Puberty - as the rate of general body growth begins to slow down, reproductive tissues begin to mature. This period during adolescence is called puberty.

commons changes in boys and girls

- ✓thick hair growing in new parts of the body (armpits and genital areas).
- ✓darkening of these parts.
- ✓thinner hair on legs, arms and face
- ✓skin becomes oily, develop pimples.

changes in boys

- thick hair growth on face.
- voice begins to crack.
- penis becomes enlarged and erect.

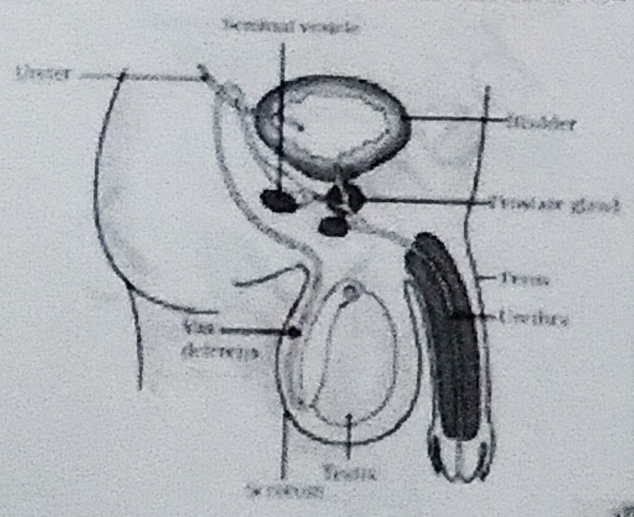
changes in girls

- Breast size increases.
- darkening of nipples
- menstruation.

male germ cell - sperm

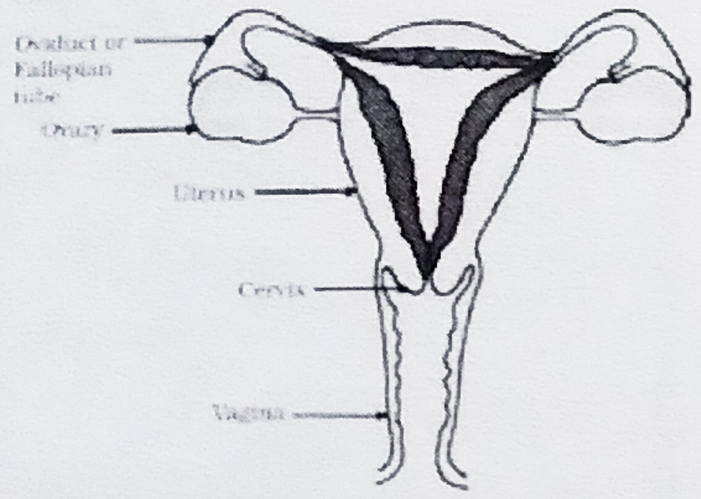
Female germ cell - eggs/ovum.

Male reproductive system



Scrotum	Maintain the low temperature of the testes (2-2.5°C lower than the normal internal body temperature
Testis	• Produce sperm cells • Produce the hormone testosterone - regulates formation of sperms - changes at the time of puberty
vas deferens	Carries sperm towards urethra
Urethra	common passage for both semen (sperm) and urine
Seminal vesicle	Secretes fructose into the semen, which provides energy for the sperm
prostate gland	secretes an alkaline buffer into the semen to protect the sperm from the acidic environment of the vagina
penis	deposits sperm into the vagina during insemination
sperm	sperms are tiny bodies that consist of mainly genetic material and a long tail that helps them to move towards the female germ cell.

female reproductive system



OVARIES	• produce the hormones estrogen and progesterone • site of ovum (egg cell) development and ovulation • contain thousands of immature eggs, on reaching puberty some of these start maturing • one egg is produced every month by one of the ovaries
FALLOPIAN TUBES (OVIDUCTS)	• carry the ovum from the ovary to the uterus • site of fertilization
UTERUS (WOMB)	• elastic, bag like structure in which the embryo and foetus develops • involved in menstruation
cervix	• Separates the vagina from the uterus • dilates during birth to allow the fetus to leave the uterus
vagina	• provides a passageway for sperm and menstrual flow • functions as the birth canal

sexual intercourse :-

sperm → enter through the vaginal passage

↓

travel upwards → reaches ovary duct

↓

encounters egg

fertilization:-

fertilized egg (zygote) → divides to form a ball of cells (embryo)

↓

implanted in the lining of the uterus → grow & develop organs to become foetus

The uterus prepares itself every month to receive and nurture the growing embryo. The lining thickens and is richly supplied with blood to nourish the growing embryo.

PLACENTA :-

- ✓disc embedded in the uterine wall.
- ✓provides nutrition to embryo from mother's blood.
- ✓Villi on placenta (embryo side) provides a large surface area for -
  - glucose and oxygen to pass from the mother to the developing embryo.
  - wastes to pass from the embryo to the mother through placenta.

GIRL CHILD → MENARCHE (Beginning of menstruation) → MENOPAUSE (stoppage of Menstruation) → OLD AGE

MENSTRUATION:-

Menstruation is the process of shedding the uterine lining leading to vaginal bleeding on a regular monthly basis

Reproductive Health

CONTRACEPTIVE METHODS:-

Physical Barrier:-

- ✓To prevent union of sperm and egg.
- ✓Protection from sexually transmitted disease (STD)
- ✓ Use of condoms, Diaphragm & cervical caps

Hormonal Barrier:-

- ✓Oral contraceptive (OCPs) - changes the hormonal balance to prevent the egg release in females.
- ✓Take orally.
- ✓Oral contraceptives cause side effect.

IUCD:-

- ✓Intrauterine contraceptive device (copper-T or loop) is placed in uterus to prevent pregnancy.
- ✓can cause irritation of uterus.

Surgical barrier

- ✓Also called sterilization in vasectomy, the vas deferens of male is blocked to prevent sperm transfer.
- ✓In tubectomy, the fallopian tube of female is blocked to prevent egg to reach uterus.

CURRENT YEAR QUESTIONS

Question-1) (a) What is reproduction? Explain how it helps in providing stability to the population of a species. Why is reproduction considered one of the most important characteristics of living beings? Give three reasons in support of this statement.

(b) What is DNA? What happens to DNA when a cell reproduces? Define DNA copying and explain its importance. Newly formed DNA copies may not always be identical- state one reason for this variation.

(c) Name the life process of an organism that helps in the growth of its population. How do the modes of reproduction differ in unicellular and multicellular organisms?

(d) Define asexual Reproduction and state two advantages of this mode of reproduction. Explain the difference between binary fission and multiple fission, providing one example for each.

(e) Describe budding in Hydra with the help of a labeled diagram.

CBSE 2015, 2016, 2017, 2019, 2021, 2022, 202

Question-2) (a) What is vegetative propagation? List two advantages and two disadvantages of this method. Name two plants that reproduce by vegetative propagation & describe how they do so. Why vegatative propagation is practised for growing only some type of plants?

(b) What is regeneration? Explain the process of regeneration in planaria.

(c) Differentiate between binary fission in Amoeba and leishmania. Name the disease caused by *Leishmania*.

(d) Explain the process of spore formation in Rhizopus with a labeled diagram. Why does Rhizopus not multiply on a dry slice of bread? List two conditions required for its growth.

CBSE 2015, 2016, 2021, 2022, 2024

Question-3) (a) What are organisms called that bear both male and female reproductive organs in the same individual? Give one example.

(b) List two unisexual flowers and name the reproductive structure found in the stamen

(c) In the given diagram, name the parts where (i) pollen grains are produced, and (ii) pollen grains are transferred.

(d) Which of the following flowers will have a higher possibility of self-pollination? Mustard, Papaya, watermelon, Hibiscus. (CBSE 2021-22, 2023)

(e) What is tissue culture? Write its advantages?

Question-4) Pollination is an important process in sexual Reproduction of plants. it is an essential process that facilitates fertilisation in plants. pollinating agents can be wind, water, insects & birds. several changes take place in the flower after the fertilisation has take place.

(a) Write the main difference between self-pollination and cross pollination.

(b) Name the part of the flower which attracts insects for pollination. What happens to this part after fertilisation?

(c) (i) Define fertilisation in plants. What is the fate of ovules and the ovary in a flower after fertilisation?

(ii) What is germination? In a germinating seed, which parts are know as future shoot and future root? Mention the function of cotyledon.

(d) seeds are called products of sexual Reproduction because they.

(A) give rise to new plants
(B) are formed by fusion of gametes
(C) are formed by the fusion of pollen tubes.
(D) can survive for a longer period.

(e) "Pollination may occur without fertilisation but fertilisation will not take place without pollination". Explain this statement.

(CBQ) (CBSE 2021-22, 2023, 2024)

Question-5) (a) Give reason for the following.
(i) During reproduction inheritance of different proteins will lead to altered body designs (ii) All multicellular organisms cannot give rise to new individuals through fragmentation or regeneration.
(iii) The parents and off-springs of organisms reproducing sexually have the same number of chromosomes.
(b) Draw a neat diagram showing fertilisation in a flower and label (1) pollen tube (2) Male germ cell (3) female germ cell (4) Pollen grain (5) ovary and (6) stigma on it.
(CBSE 2020, 2023)

Question-6) (a) (i) What is puberty? Mention any two changes that are common to both boys and girls in early teenage years. (CBSE 2020, 2021, 2023, 2024)
(ii) During adolescence, reproductive phase starts and
(A) General growth rate begins to slow down (B) height becomes less (C) the body weight is reduced.
(D) hair growth decrease.
(b) Describe in brief the functions of the following parts in the human male reproductive systems (i) Testes (ii) seminal vesicles (iii) Vas deferens (iv) urethra
(c) Why are testes located outside the abdominal cavity? What provides nutrition to human sperms? state the genetic consitution of a sperm.

Question-7) (a) Mention the functions of (i) fallopian tubes (ii) uterus & (iii) ovary in the human female reproductive system. (b) Draw a well labelled diagram of the male reproductive system or Draw a well labelled diagram of the female reproductive system.
(CBSE 2021, 2022, 2023, 2024)

Question-8) (a) Mention the changes which the uterus undergoes, when (i) it has to receive a zygote (ii) no fertilisation takes place. (b) state how sperms moves towards the female germ cell. (c) identify the organ in the human female reproductive system where the sperm encounters the egg cell. what will happen if it is blocked? Name the technique by which it can be blocked.
(d) What is placenta? Explain its function in humans (e) Mention the chromosome pair present in a zygote which determines the sex of (i) a female child & (ii) a male child
(CBSE 2020, 2021, 2022, 2023, 2024)

Question-9) (a) Name three contraceptive techniques/devices used by human females to avoid pregnancy. Mention the side effects caused by each.
(b) under which category of contraceptive methods, is the use of condom kept? In what way, its use better as compared to other methods of contraception?
(c) The growing size of the human population is a cause of concern for all people. The rate of birth and death in a given population will determine its size.
the process sexual maturation for reproduction is gradual
and takes place while general body growth is still going on.
maturation does not necessarily mean that the mind or body is ready for sexual acts or for having and bringing up children. various contraceptive devices are being used by human beings to control the size of the population
(i) List two common signs of sexual maturation in boys & girls.
(ii) What is the result of reckless female foeticides.
(iii) Which contraceptive method changes the hormonal balance of the body?
(iv) Write two factors that determines the size of a population.
CBQ (CBSE 2020, 2021, 2022, 2023, 2024)

Question-10) (a) List three different categories of contraceptive methods.
(b) Why has the Government of india prohibited prental sex determination by law? state its benefits in the long run.
(c) What are STDs? Name two bacterial & two viral infections caused due to unsafe sex. (2020) (CBQ)

ALAKH sir ke FARREY

HEREDITY

General Terminology :-

Heredity :- Heredity is the passing of characters from parents to offspring or one generation to next.

Variation :- The differences in the characters among the individuals of a species are called variations.

Genetics :- Genetics is a branch of biology which deals with the study of Heredity and variation.

importance of variations :- ✡✡✡

(1) The great advantages of variations to a species is that it increase the chances of its survival in a changing environment.

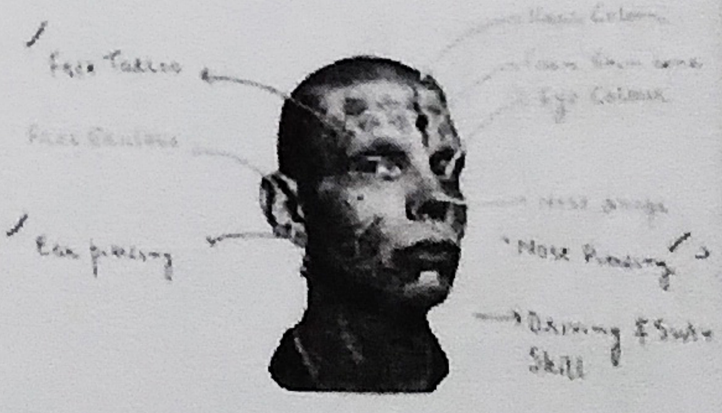
(2) variations helps in evolution and development of new species.

(3) They form basis of heredity. New characters are produced in the organisms by variations

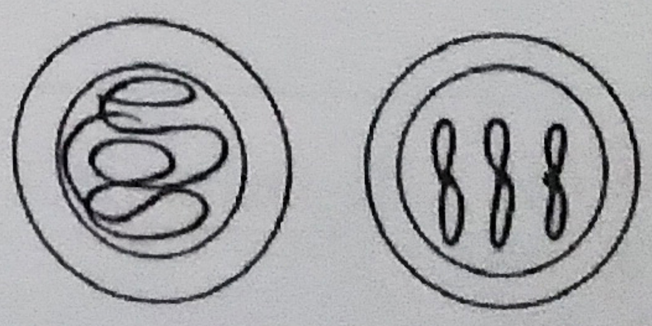
Types of traits :-

Inherited Traits
Acquired Traits

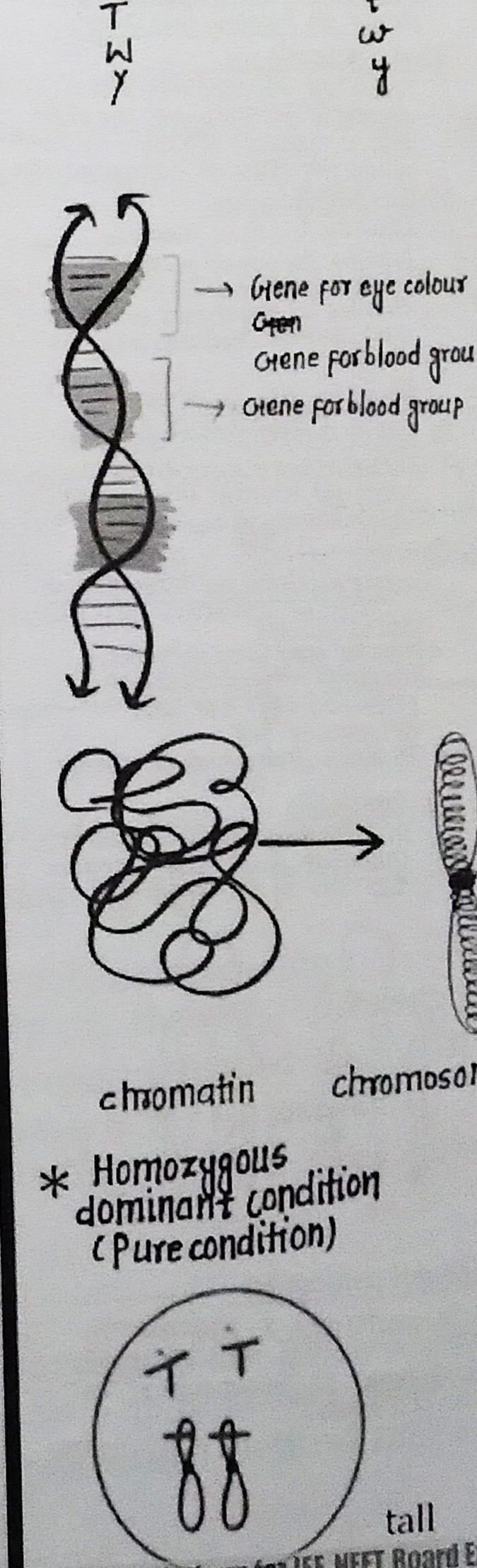
Inherited traits	Acquired traits
These traits can be inherited as well as transmitted to the next generation	These traits are neither inherited nor transmitted to the next generation
These traits are inherited from parents during reproduction	These traits are acquired after birth
Example – Attached or free earlobe, curly hair, eye colour	Example – Piercing of ear and nose, dancing, singing driving skills, muscular body

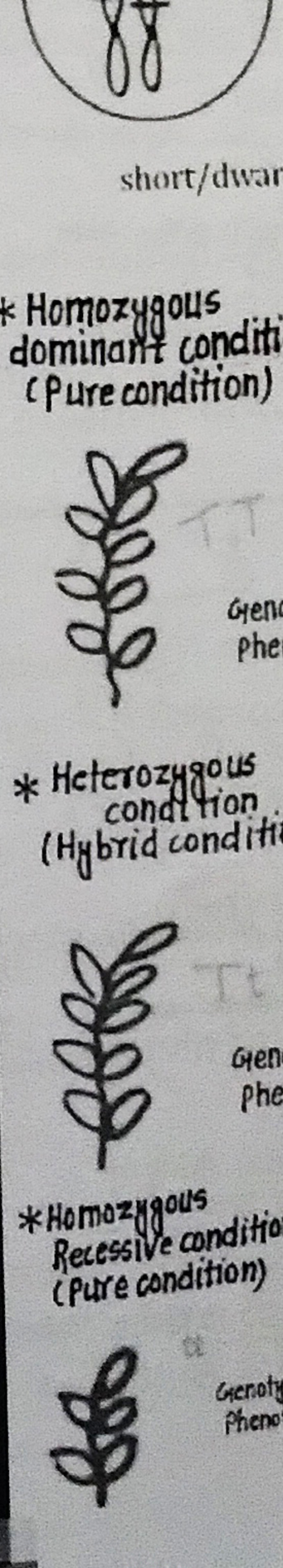


some important terms :-



chromatin chromosome





Mendel and his contribution

- He worked on pea plant (Pisum sativum) and proposed laws of inheritance.
- He choose Garden pea plant as his experimental material because of following property.

	Property	Advantages of property
a.	Short life cycle	Results of experiments were obtained in less time
b.	Annual Plant	Many generations can be studied within a short period of time
c.	Chance of cross or self fertilization	Mendel could conduct experiments as per his desire
d.	7 pairs of allelic characters	Large number of chance for experiments
e.	Large number of offspring	Good number of data for statistical analysis

GENE	ALLELES	
Character	**Dominant Trait**	**Recessive Trait**
Seed shape	Round	Wrinkled
Seed colour	Yellow	Green
Flower colour	violet	White
Pod shape	Full	Constricted
Pod colour	Green	Yellow
Flower position	Axial	Terminal
Stem length	Tall	Dwarf

Monohybrid Cross :–

It is a cross in which only one character in studied at time.

Phenotypic ratio

Phenotypic ratio in F_2 Generation

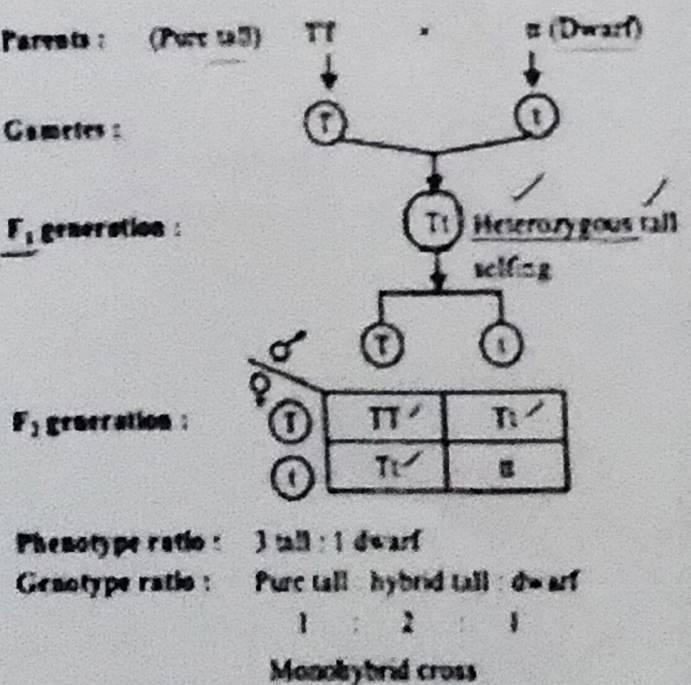
(3:1)

Genotypic ratio

Genotypic ratio in F_2 Generation

TT : Tt : tt

(1 : 2 : 1)



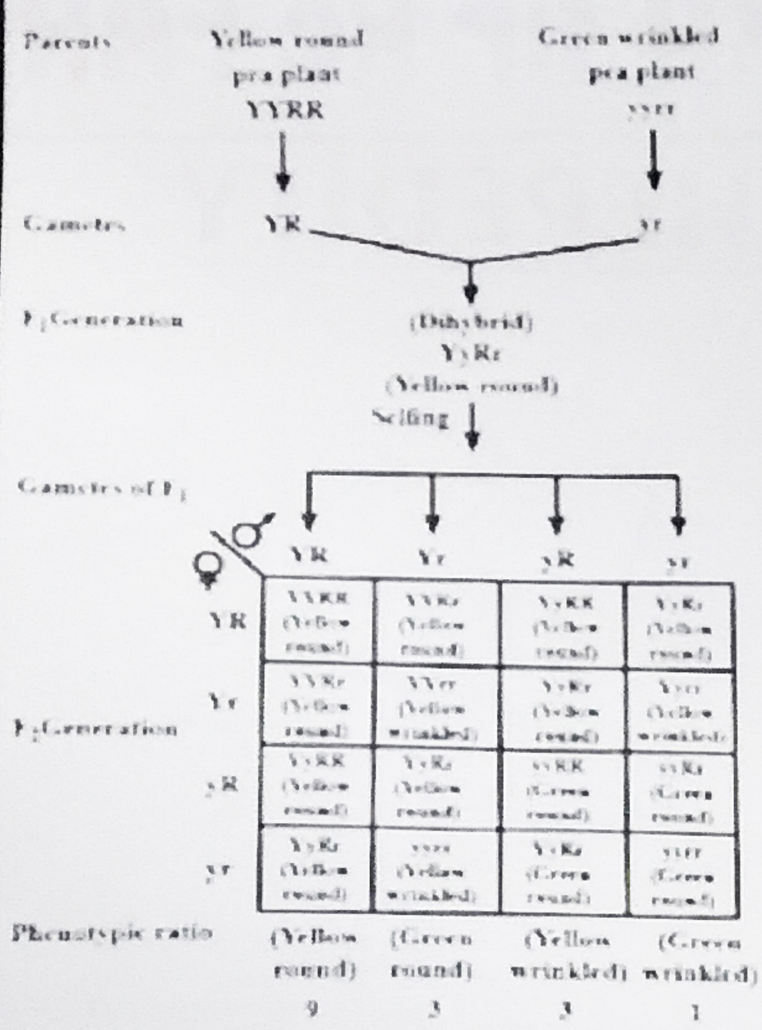
Dihybrid Cross :–

A cross in which study of inheritance of two pairs of contrasting traits.

Phenotypic Ratio

Phenotypic ratio in F_2 Generation

(9:3:3:1)



MENDEL'S LAW OF INHERITANCE

Based on Monohybrid Cross

(1) Laws of Dominance

When an inherited pair of two alleles is heterozygous the allele that is express is called dominant while the other is called Recessive

(2) Laws of Segregation

(laws of Purity of gametes)

Durning the gamete formation, copies of genes or alleles are divided or segregated such that each gamete receives only one allele.

Based on Dihybrid Cross

(3) Law of independent assortment

Alleles of two or more different genes get assorted into gametes independently of one another.

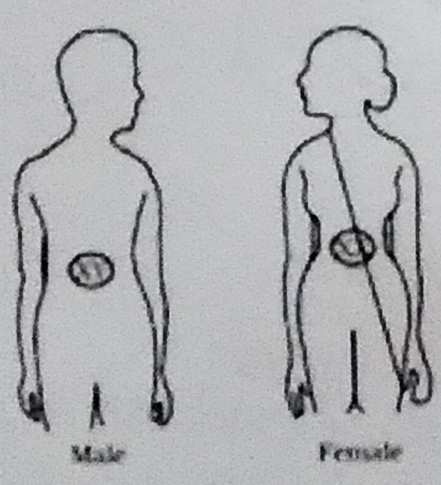
Factors affecting sex Determination

Non-Genetically

- Environmental cues - In turtles, alligators, crocodile, which fertilized eggs are kept determines sex.
- In snails, individuals can change sex.

Genetically

- In humans, genes/chromosomes inherited from parents decides the sex of the offspring.



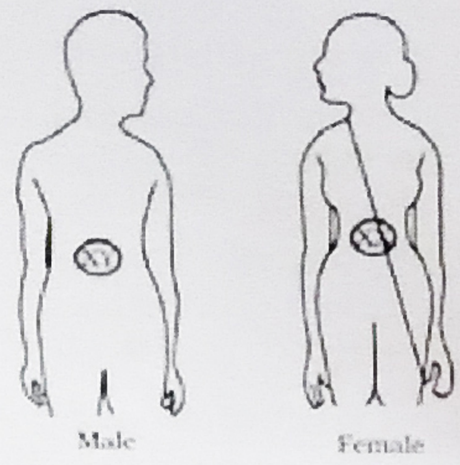
Sex determination

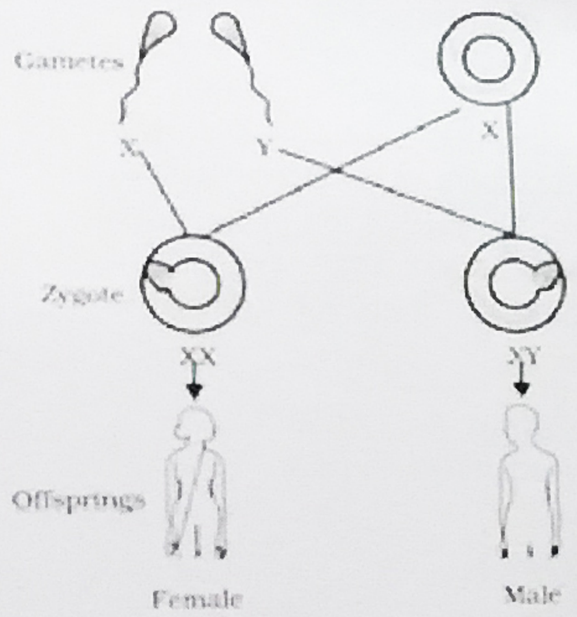
(ii) If a sperm with X chromosome fertilises the egg then the zygote will have XX chromosome in the 23rd pair.

(iii) A zygote with XX chromosome will develop into a girl child.

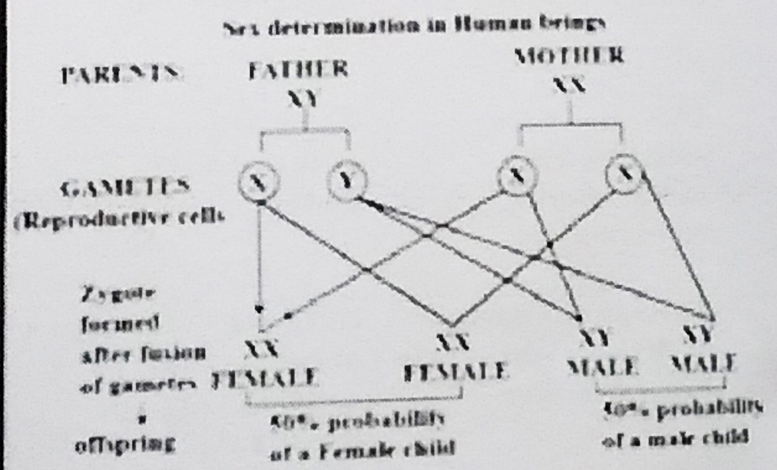
(iii) If a sperm with Y chromosome fertilises the egg then the zygote will have XY chromoses on the 23rd pair

(iv) A zygote with XY chromosome will develop into a male child.





Sex determination in human beings



HEREDITY(CYQ)

Question-1) (i) Which one of the given statements is incorrect?

(a) DNA has the complete information for a particular characteristic.
(b) DNA is the molecule responsible for the inheritance of characters from parents to offspring.
(c) change in information will produce a different protein.
(d) characteristics will remain the same even if protein changes.

(ii) What are chromosomes? Explain how the original number of chromosomes present in the parent are restored in progeny.

(CBSE 2021, 2022, 2023, 2024)

Question-2) (i) What is heredity?

(ii) How many pairs of chromosomes are present in human beings?

(CBSE 2016, 2017, 2018, 2020, 2021)

Question-3) (i) Why did Mendel carry out an experiment to study inheritance of two traits in garden-pea?

(ii) List pairs of visible contrasting characters of garden pea plants used by Mendel for his experiments stating the dominant and recessive characters in each pair.

(CBSE 2020, 2024)

Question-4) Mendel crossed pea plants with two pairs of contrasting characters as given below.

RRYY X rryy
Round, yellow Wrinkled, Green

He observed 4 types of combinations in F_1 generation. which of the combinations were new? By which method did he obtain F_2 generation? Write the ratio of the parental combinations obtained and what conclusions were drawn from this experiment.

(CBSE 2023, 2024)

Question-5) CBQ

A green stemmed rose plant denoted by GG and a brown stemmed rose plant denoted by gg are allowed to undergo a cross with each other.

(i) List your observations regarding.
(a) colour of stem in their f1 progeny.
(b) Percentage of brown stemmed plants in F_2 progeny if plants are self-pollinated.
(c) Ratio of GG and Gg in the F_2 progeny.

(iii) Based on the findings of this cross, what conclusion can be drawn?

Question-6) In some families, either rural or urban, females are tortured for giving birth to a female child. They do not seem to understand the scientific reason behind the birth of a boy or a girl.

Women have a perfect pair of sex chromosomes. But men have a mismatched pair in which one is normal sized while the other is a short one.

(i) Justify the statement that the sex of a newborn child is determined by what they inherit from their father, not the mother, with the help of a flow diagram.

(ii) How is the sex of a newborn individual determined in different species of animals except human beings? Give two examples to support your answer.

(CBSE 2021, 2022, 2023, 2024) CBQ

Question-7) (i) "Sexual reproduction gives rise to more viable varitions than asexual Reproduction". Justify this statement.

(ii) Explain how the viable variations affect the evolution of those organisms that reproduce sexually as compared to asexually reproducing organisms

(2019, 2023)

ALAKH SIR ke FARREY

LIGHT REFLECTION AND REFRACTION

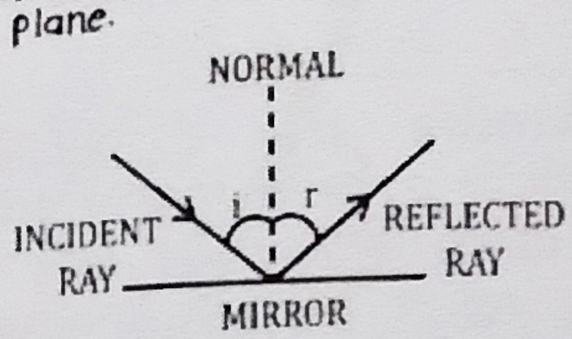
REFLECTION OF LIGHT

The Bounching back of light when it hits a polished surface like mirror.

Laws of Reflection :-

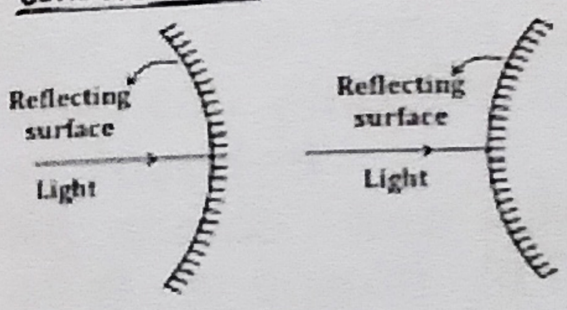
(i) $\angle i = \angle r$
Angle of incidence = Angle of Reflection

(ii) The incident ray, reflected ray, and the normal, all lie in the same plane.

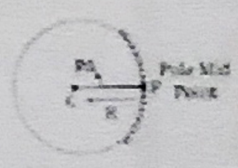


Spherical Mirrors :-

concave mirror **convex mirror**



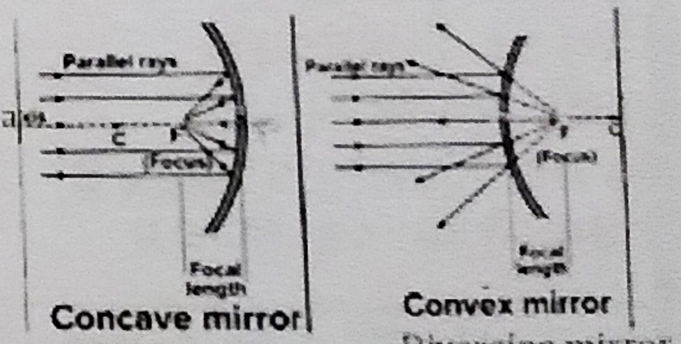
Pole :- Centre is reflecting surface of spherical mirror.
Centre of Curvature - Centre of the sphere of which the mirror is part of



Principal Axis - line joining P and C
Radius of Curvature - Distance PC

* Principal Axis is normal to mirror at Pole.

Principle Focus (F) and Focal length (f) :-

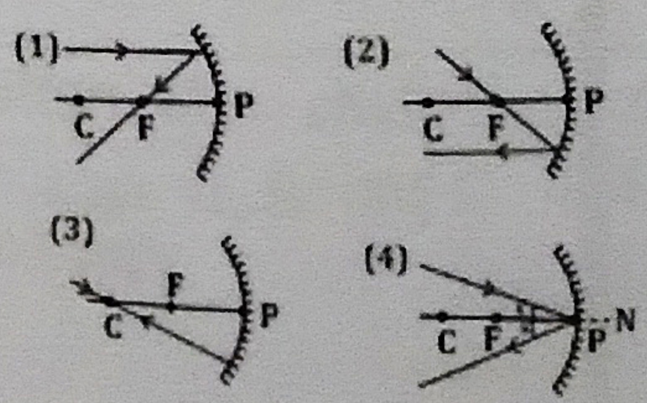


In our syllabus
$R = 2f$

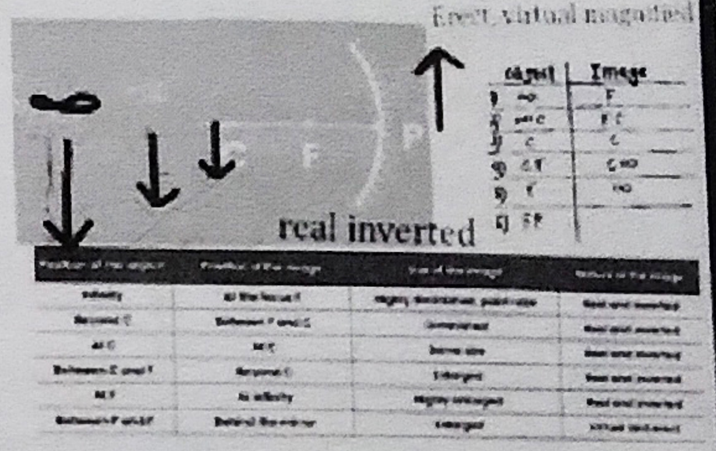
Image formation and characteristics

- If rays of light actually meet → Real
- If rays of light appear to meet → Virtual

Image formation -Concave mirror



Position of object	Figure	Position of image	Nature of image
1. At infinity		At the principal focus or in the focal plane	Real, inverted extremely diminished in size
2. Beyond the centre of curvature		Between the principal focus and centre of curvature	Real, inverted and diminished
3. At the centre of curvature		At the centre of curvature	Real, inverted and equal to object
4. Between focus and centre of curvature		Beyond centre of curvature	Real, inverted and bigger than object
5. At the principal focus		At infinity	Extremely magnified
6. Between the pole and principal focus		Behind the mirror	Virtual, erect and magnified



Uses of Concave Mirror

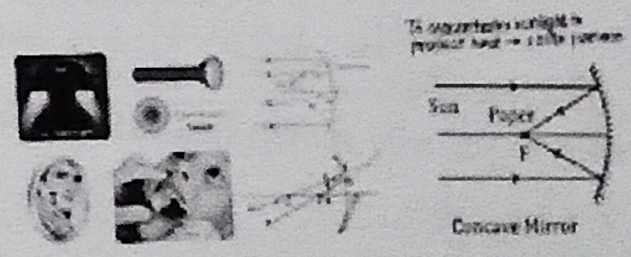
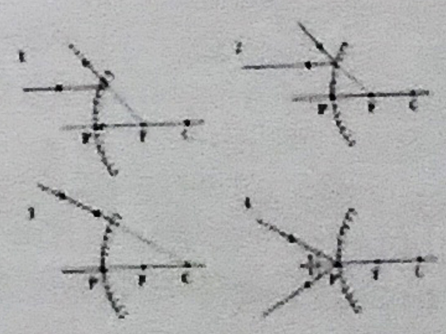
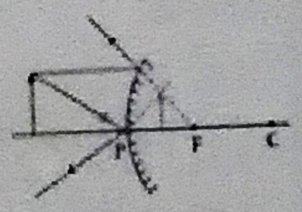


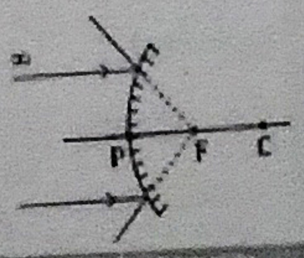
Image Formation : convex Mirror



Object at finite distance :-
(anywhere except ∞)
Characteristics
Image between F and P.
Virtual, Erect, Diminished
upright

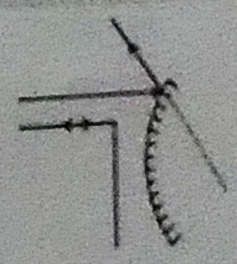


object at ∞ :-
Characteristics
Image at F
Virtual, Erect, Highly Diminished point size



Use of Convex Mirror :-

- Rear-view mirrors -
  - upright / Erect image
  - wider field of view



Summary - convex and Concave Mirrors :-

- Concave Mirror → Inverted / Erect / Virtual upright, Enlarged (Sensible + Real Image)
- Convex Mirror → only Erect, Virtual, Diminished (smaller or virtual image)

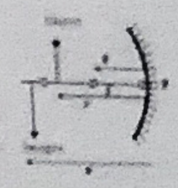
Sign Convention

In all distances are measured from pole.

Mirror formula

$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

u = object distance
v = image distance
f = focal length



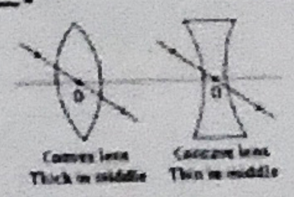
Magnification (m)

$m = \frac{hi}{ho}$ $m = -\frac{v}{u}$

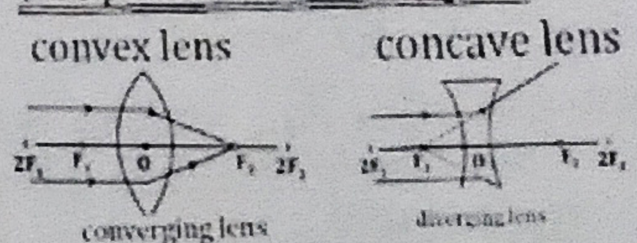
$hi = mho$

Spherical lenses :-

- Principal axis
- Optical Centre (O)

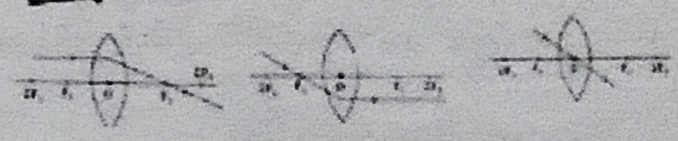


Principle Focus (F) and Focal length (f)

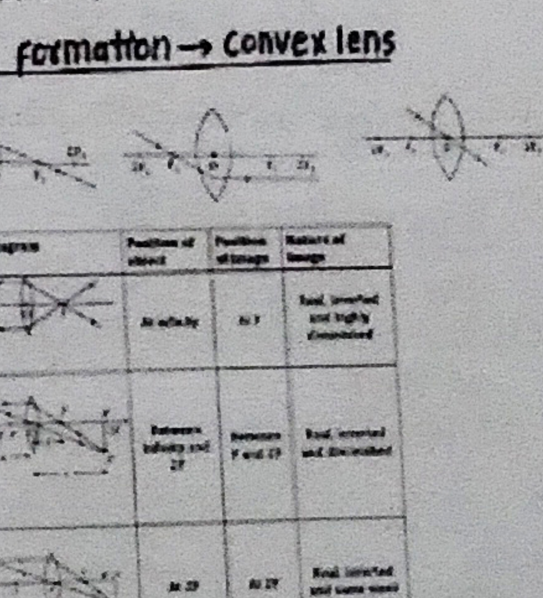


Note : They have two F (F_1 and F_2) due to two curved surfaces

Image formation → Convex lens

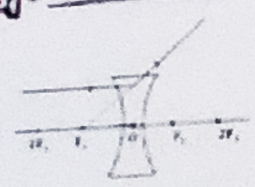


Ray diagram	Position of object	Position of image	Nature of image
	At infinity	At F	Real, inverted and highly diminished
	Between infinity and 2F	Between F and 2F	Real, inverted and diminished
	At 2F	At 2F	Real, inverted and same size
	Between F and 2F	Beyond 2F	Real, inverted and magnified
	At F	At infinity	Real, inverted and enlarged
	Between F and O	Same side of object	Virtual, erect and magnified



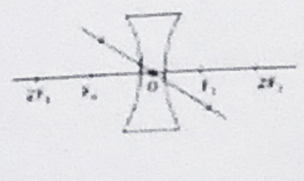
object	Image
1) ∞	F_2
2) ∞ $2F_1$	F_2 $2F_2$
3) $2F_1$	$2F_2$
4) $2F_1$ F_1	$2F_2$ ∞
5) F_1	∞
6) F_1 O	

Image Formation → Concave lens



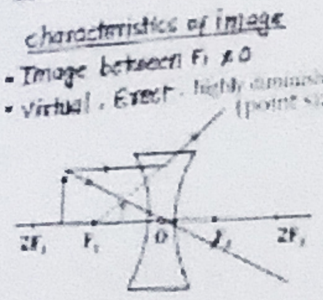
object at finite distance (anywhere except ∞)

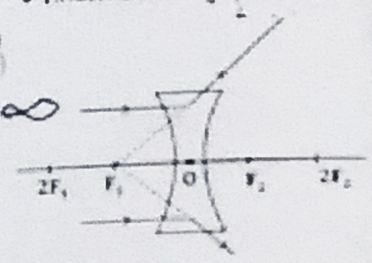
characteristics of image
- Image between F_1 & O
- Virtual, Erect, highly diminished (point size)



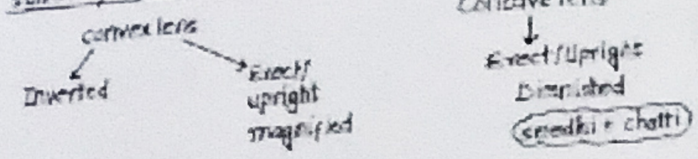
object at ∞

characteristics of image
- Image at F_1
- Virtual, Erect, Highly Diminished





summary of convex and concave lens



Sign convention, Lens formula & Magnification

1) Here all distances are measured from O (optical centre)
2) Rest all same rule for sign.

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$m = \frac{h_i}{h_o} \qquad m = \frac{v}{u}$$

u ⟶ -ve
f ⟶ +ve
convex ⟶ +ve

Power of a lens

- Ability of a lens to converge or Diverge Rays of light.
- it is defined as Reciprocal of focal length.

convex lens → +ve f, +ve P
concave lens → -ve f, -ve P

$P = \frac{1}{f}$ (f in metre)

Unit: Dioptre (D)

power of combination

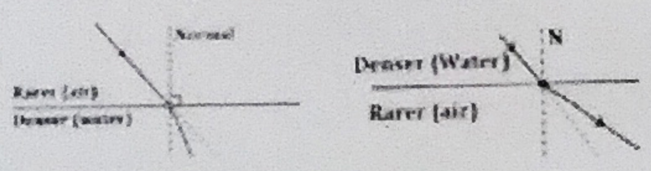
$P = P_1 + P_2 + \dots$

$P = \frac{1}{f_1} + \frac{1}{f_2} + \dots$

f_1, f_2 ⟶ in metres

Refraction of light :-

The Bending of light ray when its travels from one medium to another.



Rarer to Denser Medium Bends towards the normal

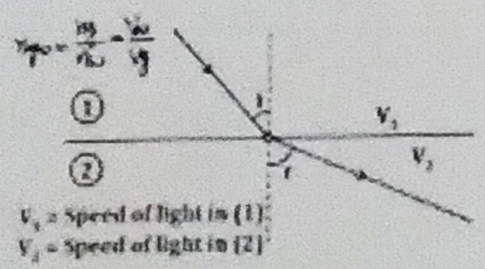
Denser to Rarer Medium Bends away from the normal

No change in medium No Bending

$$n_{21} = \frac{n_2}{n_1} = \frac{V_1}{V_2}$$

Refractive Index (R·I)

Measure of How dense a medium is



R·I of 2 w·r·t 1

$$n_{21} = \frac{n_2}{n_1} = \frac{V_1}{V_2}, \quad n_{gw} = \frac{n_g}{n_w} = \frac{V_w}{V_g}$$

Absolute Refractive index

When first medium is air and second medium is any medium.

R·I of water w·r·t Air

$$\eta_{wa} = \frac{n_w}{n_a} = \frac{V_a}{V_w}$$

n = 1
$V_a = c$

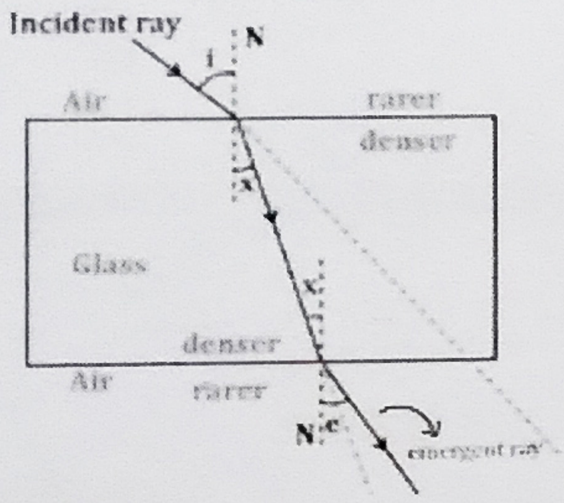
$$\eta_w = \frac{c}{V_w}$$

$$\eta_x = \frac{c}{V_x}$$

✓ R·I of glass is 1·5
✓ R·I of water is 1·33

✡ Which is more dense? Glass
✡ In which light travels faster → water

Refraction Through A Glass Slab



To remember
① emergent ray is parallel to incident ray.
② ∠e = ∠i

Laws of Refraction :-

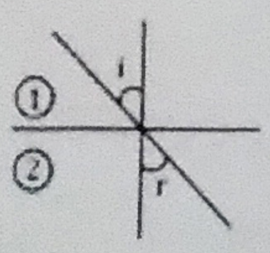
(i) The incident ray, Normal & the refracted ray lies on the same plane.
(ii) The ratio of sine of Angle of incidence to the sine of angle of refraction remains constant for a given pair of media.

Snell's law :-

$$\frac{\sin i_1}{\sin r_1} = \frac{\sin i_2}{\sin r_2}$$

$$\frac{\sin i}{\sin r} = \text{constant}$$

i ⟶ change i_1 r_1
r ⟶ change i_2 r_2

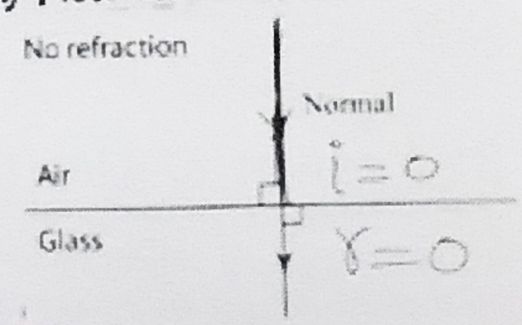


$$n_1 \sin i = n_2 \sin r$$

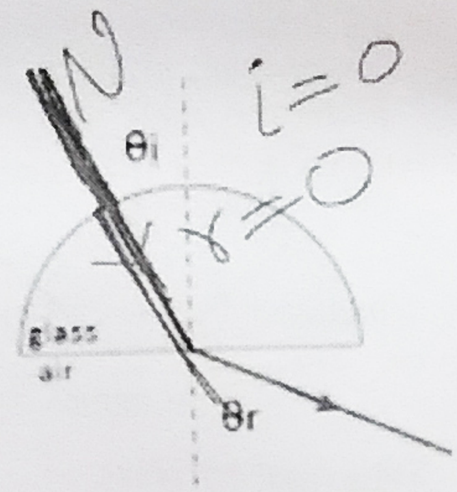
$$\frac{\sin i}{\sin r} = \frac{n_2}{n_1} = {}_1\mu_2$$

Case of NO Bending

1) Normal incidence



2) No medium change or no change in refractive index



LIGHT (CYQ)

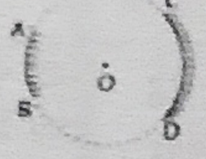
Question-1) (i) The Relation $R = 2f$ is valid
for concave mirrors but not for convex mirror
for convex mirrors but not for concave mirror.
neither for concave mirrors nor for convex mirror
for both concave and convex mirrors

CBSE 2021, 2022, 2023

(ii) The radius of curvature of a converging mirror is 30cm. At What distance from the mirror should an object be placed so as to obtain a virtual image?
(a) infinity (b) 30 cm (c) Between 15cm & 30cm (d) Between 0cm & 15cm

(iii) The magnification produced when an object is placed at a distance of 20cm from a spherical mirror is +1/2. Where should the object be placed to reduce the magnification to +1/3 ?

Question-2) A spherical mirror forms a real, inverted image with a magnification of 2. if the image is at a distance of 30cm from the mirror, determine the object's position and the mirror's focal length. Additionally, list two characteristics of the image if the object is moved 10cm closer to the mirror.
The image of a candle flame placed at a distance of 30cm from a mirror is formed on a screen placed in front of the mirror at a distance of 60cm from its pole. What is the nature of the mirror? find its focal length, if the height of the flame is 2.4 cm. find the height of its image. state whether the image formed is erect or inverted.
AB and CD, two spherical mirrors, from parts of a hollow spherical ball with its centre at O as shown in the diagram. if arc AB = 1/2 arc CD, what is the ratio of their focal lengths? state which of the two mirrors will always from virtual image of an object placed in front of it and why?



CBSE (2016, 2017, 2019, 2020)

Question-3) (a) Draw ray diagrams for the following cases when ray of light.
(i) passing through centre of curvature of a concave mirror is incident on it.
(ii) parallel to principal axis is incident on convex mirror.
(iii) is passing through focus of a concave mirror incident on it.

CBSE 2019, 2020

(b) Where should an object be placed in front of a concave mirror of focal length 20cm so as to obtain a two times magnified virtual image of the object?

Question-4) (i) The linear magnification produced by a spherical mirror +3". Based on this statement answer the following questions: What is the type of mirror?
(ii) The image formed by a spherical mirror is real, inverted and its magnification is -2. if the image is at a distance of 30 cm from the mirror. , Where is the object placed? find the focal length of the mirror. List two characteristics of the image formed if the object is moved 10 cm towards the mirror. CBSE 2016, 2024

Question-5) study the data given below showing the focal length of three concave mirrors A, B and C and the respective distances of objects placed in front of the mirrors.

Case	Mirror	Focal Length (cm)	Object Distance (cm)
1	A	20	45
2	B	15	30
3	C	30	20

(a) In which one of the above cases the mirror will form a diminished image of the object? Justify your answer. Also draw a ray diagram to show the type of image formed when an object is placed between pole and focus of a concave mirror as in case 3.

(b) List two properties of the image formed in case 2 and applications of concacave mirror

(ii) Neha visited a dentist in his clinic she observed that the dentist was holding an instrument fitted with a mirror state the nature of this mirror and reason for its use in the instrument used by dentist. (CBSE 2020, 2023, 2024)

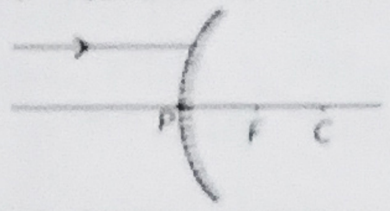
Question-6) (a) Define the principal axis of a concave mirror if a ray of light is incident on a concave mirror, parallel to its principal axis. After reflection from the mirror passes through the principal axis from a point at a distance of 10cm from the pole of the mirror, find the radius of curvature of the mirror.

(b) An object 4cm in height is placed at 15cm in front of a concave mirror of focal lengt 10cm. At what distance from the mirror should a screen be placed to obtain a sharp image of the object. Calculate the height of the image. (CBSE 2016, 2019, 2023, 2024)

Question-7 (a) An object is placed at a distance of 10cm from the pole of a convex mirror with a focal length of 15cm. Determine the position of the image. Draw a ray diagram to illustrate image formation in this case. Also, identify the type of mirror that always forms a virtual, erect, and diminished image.

(b) A security mirror used in a big showroom has radius of curvature 5m. If a customer is standing at a distance of 20m from the cash counter, find the position, nature and size of the image formed in the security mirror.

(ii) A ray of light is incident on a convex mirror. Redraw the given diagram and complete the path of the reflected ray. Mark the angle of incidence and the angle of reflection on your diagram.



(CBSE 2017, 2019, 2020, 2023) CBQ

Question-8) (i) Absolute refractive index of glass and water is 3/2 and 4/3 respectively. if the speed of light in glass is 2×10^8 m/s, the speed in water is

(a) $9 \times 4 \times 10^8$ m/s
(b) $5/2 \times 10^8$ m/s
(c) $7/3 \times 10^8$ m/s
(d) $16/9 \times 10^8$ m/s

(ii) Determine the speed of light in diamond if the Refractive index of diamond with respect to vaccum is 2.42. speed of light in vaccum is 3×10^8 m/s.

The refrective index of a medium 'x' with respect to a medium 'y' is 2/3 and the refractive index of medium 'y' with respect to medium 'x'. if the speed of light in medium 'x' is $3 \times 10^8 ms^{-1}$, calculate the speed of light in medium 'y'.

(ii) - medium 'y' with respect to medium 'z' is 4/3 (CBSE 2020, 2023, 2024)

Question-9) (i) The power of a lens is +4D. find the focal length of this lens. An object is placed at a distance of 50cm from the optical centre of this lens. state the nature and magnification of the image formed by the lens and also draw a ray diagram to justify your answer.

(ii) (a) What is the nature (convergent/divergent) of the combination of a convex lens of power +4D and a concave lens of power -2D? (CBSE 2018, 2021, 2022, 2023)

(b) calculate the focal length of a lens of power -2.5D? (CBQ)

(c) Draw a ray diagram to show the nature and position of an image formed by a convex lens of power +0.1D, when an object is placed at a distance of 20cm from its optical centre.

Question-10) (i) if 5cm tall object is placed perpendicular to the principle axis of a convex lens of focal length 20cm. The distance of the object from the lens is 30 cm. find the position, nature and size of the image formed.

(ii) At what distance from a concave lens of focal length 25cm a 10cm tall object be placed so as to obtain its image at 20cm from the lens. Also calculate the size of the image formed. (CBSE 2015, 2016, 2019, 2020, 2024)

ALAKH sir ke FARREY

HUMAN EYE AND COLOURFUL WORLD

(i) Eyeball :- Approximately spherical. Diameter 2.3cm

(ii) Cornea :- • Thin transparent bulging membrane
• Most of the refraction happens
• Protects from dust, germs

(iii) Iris :- Controls the size of pupil

(iv) Pupil :- Regulates and controls the amount of light entering the eye

(v) Crystalline lens :- convex lens
Flexible focal length
forms Real and Inverted image

(vi) Ciliary Muscles - Adjust the focal length of eye lens

(vii) Retina :- Screen

- Real Inverted Image is formed on Retina.
- has lots of light sensitive cells.
- Rods - vision in low light (light Intensity)
- Cones - vision in high light + colour vision
- cells get activated when light falls on them and generates electrical signal.

(ix) optical nerve :- sends electrical signal to the brain.
(light, Nerve fibre)

(x) Aqueous Humour
- water like fluid.
- it is present between lens and Cornea.
- Nutrition.

Vitreous Humour
- Gel like substance.
- present between lens and Retina.
- Support and strength helps the eye to keep its shape.

Power of Accomodation

The ability of eyelens to adjust/change its focal length.

NEAR POINT :- The minimum distance from eye at which an object can be seen clearly and distinctly.
it is also called least Distance of Distinct vision.
For normal vision (young adults) - 25cm

FAR POINT :- The farthest (sabse door) point upto which the eyes can see objects clearly.
For normal eyes → infinity.

CONVERGING LENS — DIVERGING LENS

To View closer objects

Ciliary muscle Contract

lens become thick (Curvature increases) $\theta \uparrow$

focal Length decreases $P \uparrow$

To View distant (far) objects.

Ciliary muscle relaxes $P = \frac{1}{f}$

lens becomes thin (curvature decreases) $\theta \rightarrow r$

focal length Increases $F \uparrow P \downarrow$

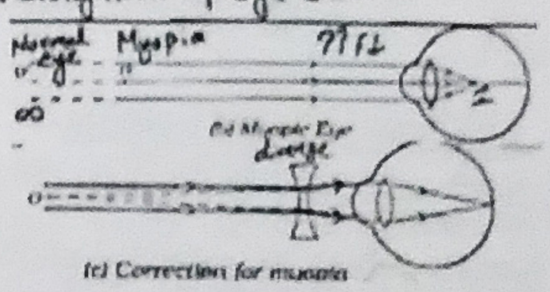
DEFECTS in HUMAN EYE And Corrections

(1) Myopia :-
(Near Sightedness)

- can see nearby objects clearly.
- cannot see distant objects distinctly (Clearly)
- Far point is less than infinity.

* image of distant object is formed in front (before) of Retina.

Reasons :-
(i) Excessive curvature of eyelens
(ii) lens thick → focal length decreases
(iii) Elongation of eye ball.



(c) Corrections for myopia

Negative power lens — CORRECTION - CONCAVE LENS

trick-

MyoNI makes Elon Thick, went CAVE

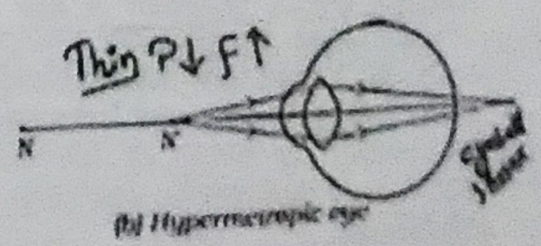
Myopia — Near Sightedness — Elongation of eyeball — (res) Lens thick for — Concave Lens

(2) Hypermetropia :-
(far - Sightedness)

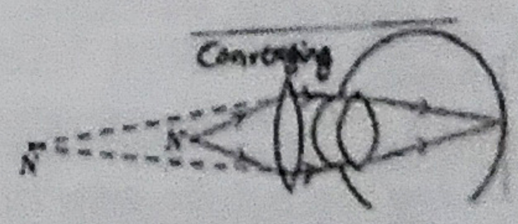
- can see distant (far) objects clearly.
- cannot see nearby objects distinctly (Clearly)
- Near point is more than 25cm.

* Image of nearby object is formed at a point behind retina.

Reason
Focal length of eye lens is too long (lens cannot get thick enough)
Eyeball has become too small.



(b) Hypermetropic eye



CORRECTION - CONVEX LENS
+ve power lens

trick-

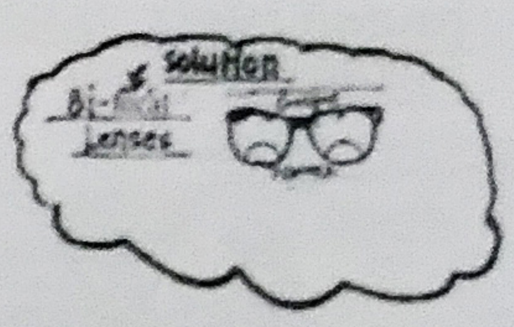
Foot Metre makes eye small, Face Large like Wax — convex lens

(3) Presbyopia :-

With ageing people find it difficult to see nearby objects distinctly (clearly). Generally they also have trouble to view far objects.

Reasons :- (i) Weakening of ciliary muscle
(ii) less flexibility of eye lens.

(iii) Cataract :- Lens become opaque
- Cataract of old eyes
Crystalline lens becomes milky and cloudy
Partial or complete loss of vision
Correction → Cataract surgery

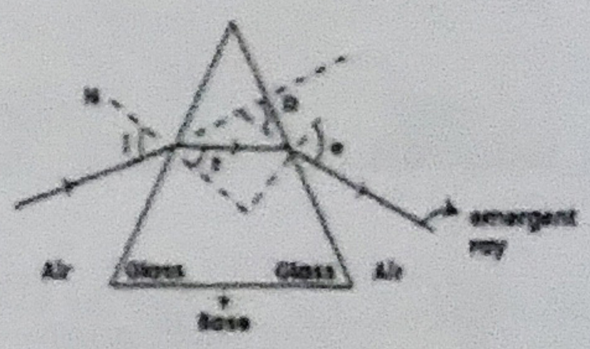


REFRACTION OF LIGHT & DEVIATION THROUGH A PRISM

Monochromatic light

∠i → incidence
∠r → Refraction
∠e → emergence
∠D → Deviation

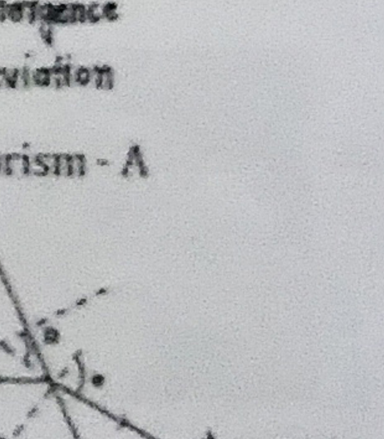
angle of prism - A



∴ A prism bends a ray of light towards Base.

- We know that white light is made up of seven colours.
- A prism bends a ray of light
Angle of Deviation (∠D)
- ∠D is different for different colours of light → some colours bends more than other

VIOLET Bends Most
RED Bends Least



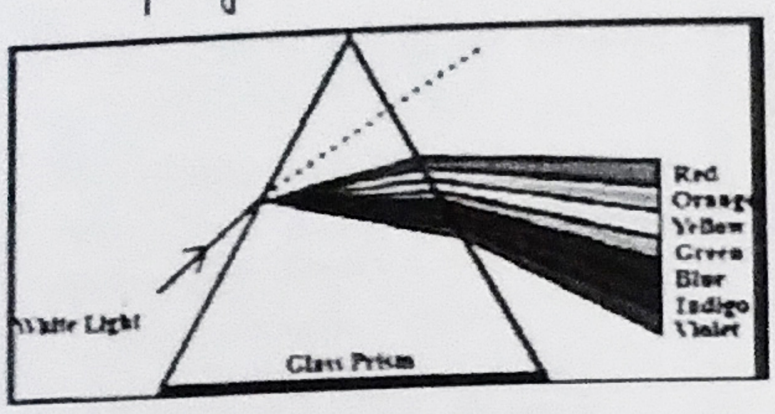
Refraction of white light (sunlight) through a PRISM.

Dispersion :-

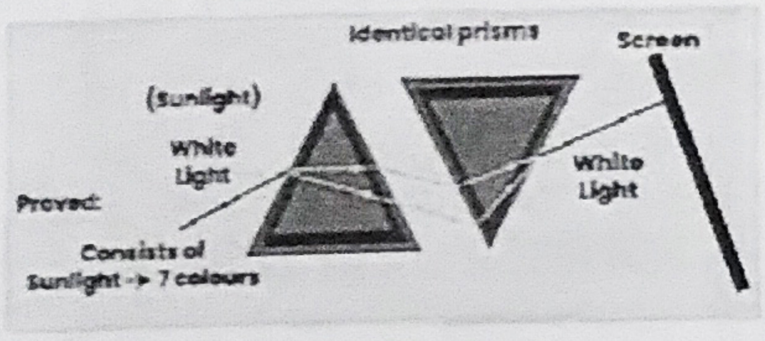
The splitting of white light into its component colours (7 colours).

Spectrum :-

The band of colour components of light (obtained on screen)

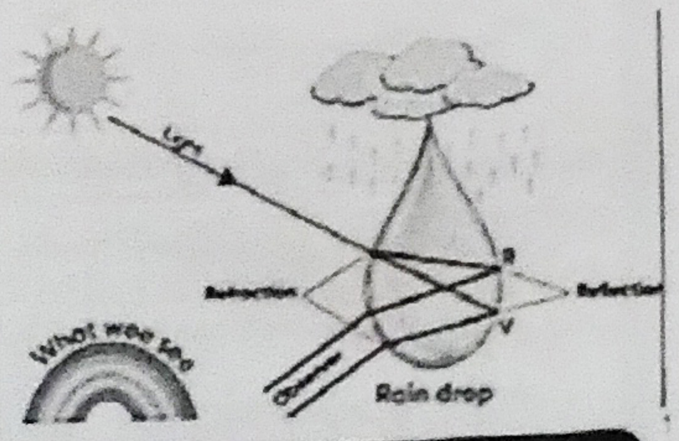


NEWTON'S PRISM EXPERIMENT (INVERTED PRISMS)

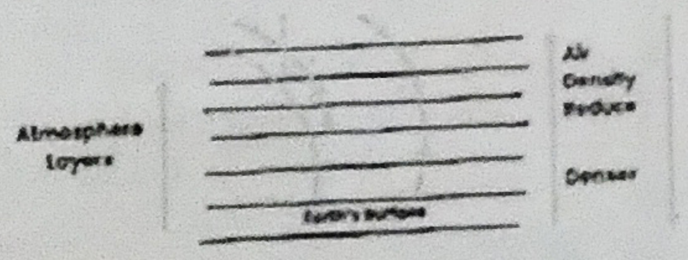


RAINBOW FORMATION

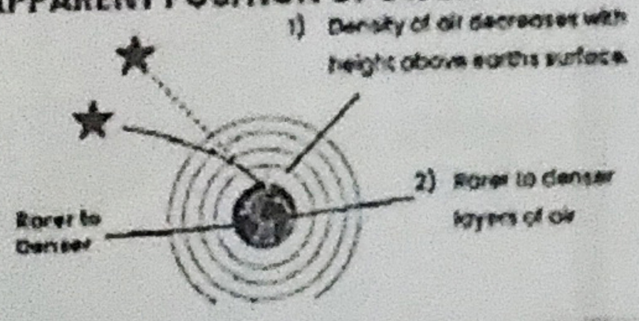
Dispersion + Refraction + Reflection



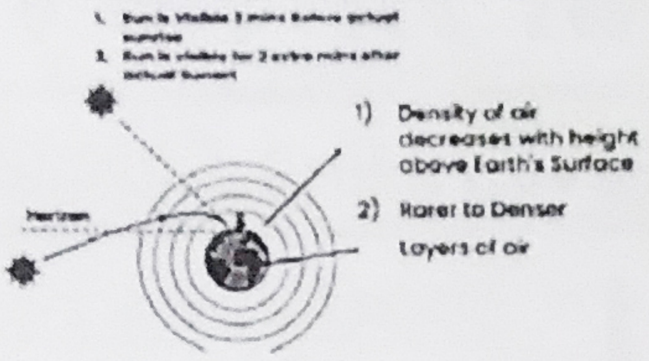
ATMOSPHERIC REFRACTION



APPARENT POSITION OF STARS



ADVANCE SUNRISE AND DELAY SUNSET

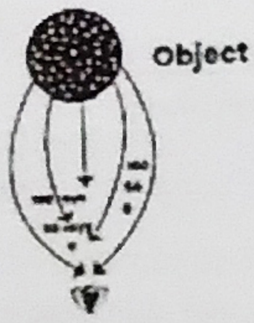


Twinkling of stars

(1) The physical conditions like temperature, pressure of earth's atmosphere keeps on varying.
(2) Due to this density of layers also keep changings.
(3) stars are very far so they behave like point source of light.
(4) The path of ray of light coming from star keep's changing and Amount of starlight entering eyes flickers

Why Planets Do not twinkle

- Planets are near to Earth as compared to stars.
- Planets behave as extended source of light.
- Extended source can be imagined as collection of millions of point source of light.
- Now, the total varitions in the amount of light entering our eye from all the individual point-sized sources Averages out to zero and intensity of light entering eye remains almost same.



TYNDALL EFFECT

- The phenomenon of scattering of light by the colloidal particles.
- A colloid is a heterogenous mixture. The size of particles of a colloid is too small to be individually seen with naked eyes.
  Example - Milk, smoke, Dust in air
- The path of a beam of light passing through a true solution is not visible. But in colloidal passing through a true solutions colloidal solutions, colloids are big enough to scatter a beam of light passing through it and make its path visible.
- The colour of the scattered light depends on the size of the scattering particles.
  (1) very small particles scatter mainly blue light (smallest wave length)
  (2) Very large particles scatter all colour of light equally.

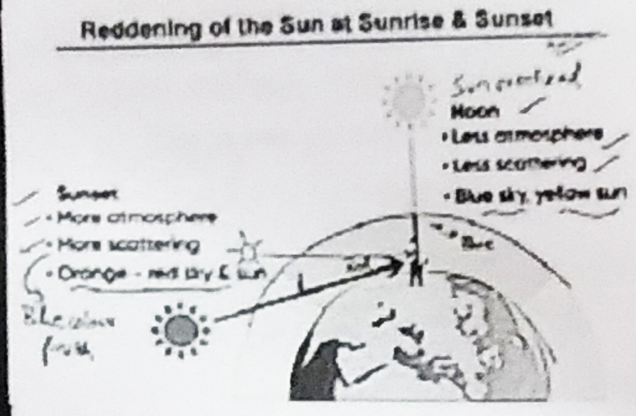
✡ Beam of sunlight enters a smoke filled room through a small hole.

✡ sunlight passes through a canopy of a dense forest. Tiny water droplets in the mist scatter light.

Blue colour of sky

(1) The molecules of air and other fine particles in the atmosphere have size smaller than the wavelength of visible light.
(2) scattering is more for light of shorter wavelength Hence Blue colour scatters more strongly than Red colour.
(3) Thus, scatters more strongly than Red colour.
Thus, scattered blue light enters our eyes and sky appears blue.

Reddening of the Sun at Sunrise & Sunset



(4) If the earth had no atmosphere there would not have been any scattering. Then the sky would have looked dark.
Astronauts - Dark

(5) The sky appears dark to passengers flying at very high altitudes. Explain
At high altitudes due to the absence of atmosphere, scattering of light do not take place and hence sky appears dark to passengers flying at high altitudes.

(6) Danger signal lights are red in colour. Explain.
Red light is least scattered by fog or smoke. Therefore, it can be seen in the same colour at a distance.

CURRENT YEAR QUESTIONS

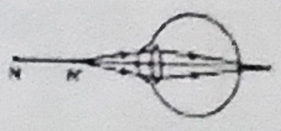
Question-1) (a) Draw schematic diagram of Human Eye and write the function of each part of the human eye.

(b) A person sufferings from both myopia and hypermetropia defects.
(i) When does it happen?
(ii) Name the type of lens often required by the person sufferings from this defects.
(iii) Draw ray diagrams to illustrate correct images, formation in the human eye for the above vision defects. 2023, 2024

(CBSE 2015, 2016, 2018, 2019, 2020)

Question-2) (a) Question: study the diagram given below and answer the question that follows. (i) Name the defect of vision deficted in this diagram stating the part of the eye responsible for this conditions.
(ii) List two causes of this defect.
(iii) Name the type of lens and used to correct this defect and explain with diagram.
(b) A person need a lens of power +3D for correcting his near vision & -3D for correcting his distant vision. calculate the focal length of the lenses required to correct these defects.

(CBSE 2020, 2023, 2024)



Question-3) Akshay sitting in the last row in his class, could not see clearly the words written on the blackboard. when the teacher noticed it, he announced if any students sitting in the front row could volunteer to exchange his with Akshay. Salman immediately agreed to exchange his seat with Akshay. He could now see the words written on the blackboard clearly. The teacher advice Akshay's parents to get his eyesight checked. In the context of the above event, answer the following questions.
(a) Which defect of visions is Akshay sufferings from? Explain with Diagram.
(b) Which type of lens is used to correct this defects? Draw a diagram.

(CBSE 2015, 2018, 2024, 2024)

Question-4) (a) What is dispersion of white light? state its cause.
(b) Draw ray diagram to show the dispersion of white light by a glass prism.
(c) White light is dispersed into seven visible coloured components by a glass prism. Name the colour that bends.
(i) The most
(ii) The least

(CBSE 2012, 2017, 2023, 2024)

Question-5) What is rainbow? Draw a labelled diagram to show the formation of a rainbow.
(a) Name the phenomenon of light responsible for the Tyandall effect. why is the this effect shown by colloidal particles?
(b) Mention instances where the Tyndall effect can be observed.
(c) List the factors on which the scattering of light depends.
(d) Explain why the apparent position of a object fluctuates or waves when seen through hot air.

(CBSE 2012, 2015, 2019, 2020, 2024)

Question-6) Differentiate between a glass slab and a glass prism.
What happens when a narrow beam of
(i) a monochromatic light and
(ii) White light passes through (a) glass slab (b) glass prism?

(iii) How can the coloured components of white light be recombined after a prism has separated them? Draw a labelled Diagram to justify your answer?

(CBQ) (CBSE 2023, 2020, 2024)

Question-7) Give reasons for the following.

(a) Red colour is used for danger signals and installed at airports and the top of tall buildings.

(b) The sky appears dark to passengers flying at very high altitudes or in space.

(c) The path of a beam of light passing through a colloidal solution is visible.

(d) The time difference between actual sunset and apparent sunset is about 2 minutes.

(CBSE 2023, 2020)

Question-8) (a) What is atmospheric refraction? Briefly explain why does the apparent position of a star appear different from its true position?

(b) Explain why the planets do not twinkle but the stars twinkle.

(CBSE 2016, 2019)

ALAKH SIR ke FARREY

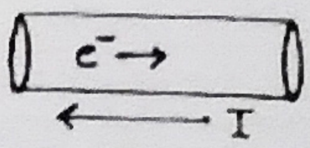
ELECTRICITY

CHARGE (Q) :-

(i) Two types of charge ⊕ & ⊖
(ii) SI Unit of charge Coulomb (C)
(iii) smallest independent charge Electron (e^-)

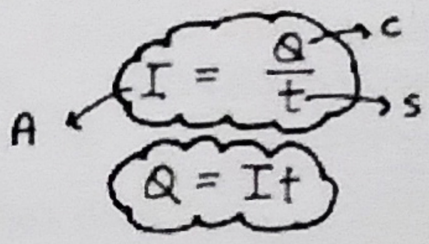
$1e^- = 1.6 \times 10^{-19} C$

⊕ → ← ⊖ Attract
← ⊕ ⊖ → } Repel
← ⊖ ⊖ → } Repel



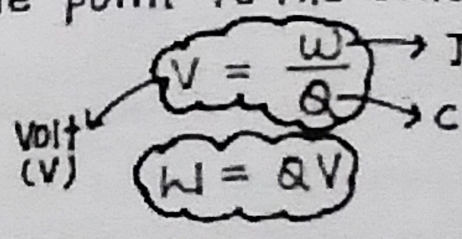
CURRENT (I) :-

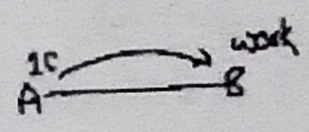
* current is Rate of flow of charge. (flow of +ve charge)
* Direction of current :- opposite to direction of flow of electron
* SI Unit of current :- Ampere (A)



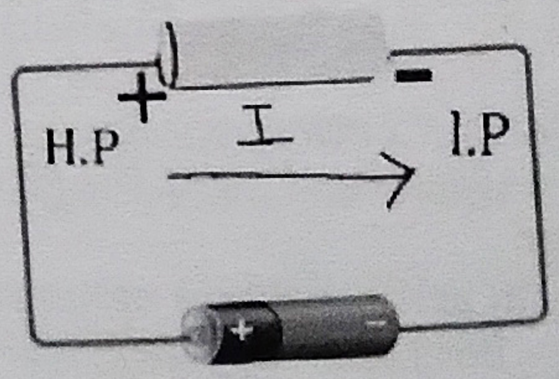
POTENTIAL DIFFERENCE [P.D] [V] :-

Potential Difference between two points is amount of work done in moving a unit charge (1C) from one point to the other.



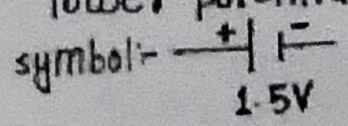


- Potential difference measured by an instrument voltmeter
- Electric current (A) is measured by Ammeter.

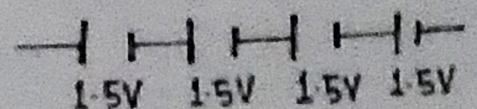


* Electron flows from lower potential to higher potential.

* current (I) flows from Higher potential to lower potential.

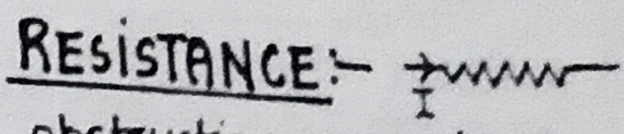
symbol :- 

combination of cell
↓
Battery



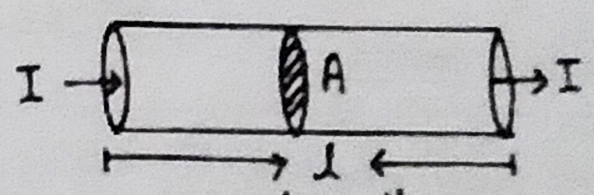
= 6V

RESISTANCE :-

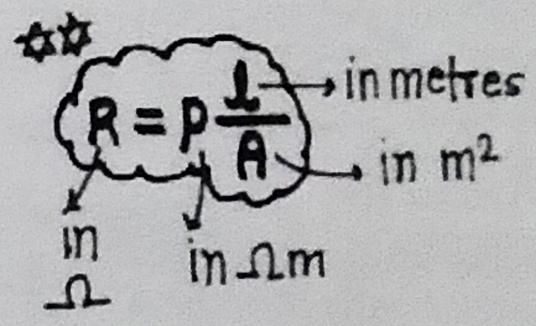


obstruction offered to the flow of charges (current)
OR
property of conductor to obstruct flow of charges.

$Q = It$
$W = QV$

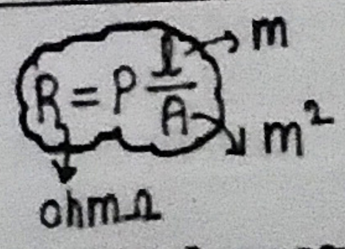


l = length
A = Area of cross section



Factors on which Resistance of (Conductor) Depends :-

(i) l $R \propto l$
(ii) A $R \propto \frac{1}{A}$



(iii) Material resistivity ρ property of material.
(iv) Temperature Temperature ↑

SI unit of R :- ohm Ω

Resistivity (ρ) :- unit = Ωm

(1) ρ is a property of the material.
(2) Metals and Alloys have low ρ → Good conductor of electricity.
copper and Aluminium are used for transmission lines.
(3) Insulators like Rubber and Glass have high ρ

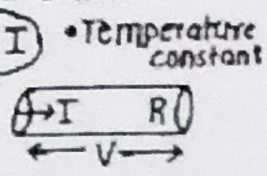
OHM'S LAW :-

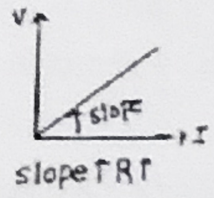
The potential difference (V) across the ends of a metallic conductor is directly proportional to the current flowing through it provided its temperature remains the same.

$V \propto I$ • Temperature constant

$V = IR$

Volt — Ampere — Ω ohm





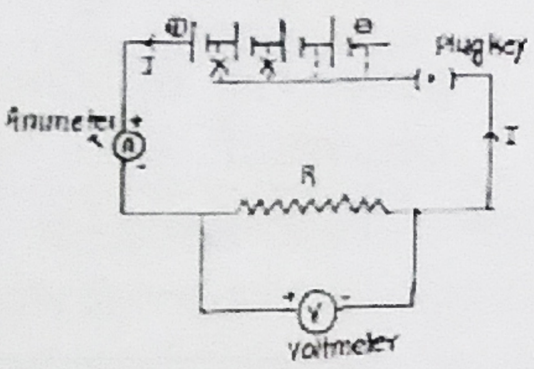
slope = R

V v/s I
straight line
pass origin

trick- VIRal

$V = IR$

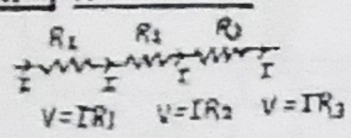
Experimental setup-



Combination of Resistors :-

[1] SERIES

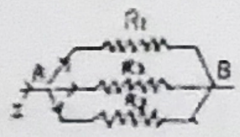
I → same
V → Different



$R_e = R_1 + R_2 + R_3$

[2] Parallel :-

I → Different
V → same



$\frac{1}{R_e} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

Disadvantage of series combination

(1) if one device fails, all others devices in that series will not work.

(2) Devices of different types need different current. for e.g a bulb and heater needs different current and cannot be connected in series. this can be done with parallel combination.

CIRCUIT DIAGRAM

CIRCUIT - Continuous & closed path of electric current.

S.No.	Components	Symbols
1.	An electric cell	
2.	A battery or a combination of cells	
3.	Plug key or switch (open)	
4.	Plug key or switch (closed)	
5.	A wire joint	
6.	Wires crossing without joining	
7.	Electric bulb	
8.	A resistor of resistance R	
9.	Variable resistance or rheostat	
10.	Ammeter	A
11.	Voltmeter	V

Electric Power :-

• Rate at which electrical Energy is consumed.

① $P = VI$ → Ampere

watt / Volt

② $P = i^2R$

③ $P = \frac{V^2}{R}$

✡ $V = iR$

✡ $i = \frac{V}{R}$

Electrical Energy (E) :-

supplied by cell

Generally E → S.I Unit → Joules

$1 Kwh = 3.6 \times 10^6 J$ but, generally E is measured in KWh

$E = P \times t$ → in hour

kwh (electrical energy)

in kw → watt / 1000

Bijli ka Bill Banao :-

Energy ka Paisa

Electric Meter ⇒ 1 unit of energy

1 unit = 1 kwh

Bill = no. of units × price of unit

Energy in kwh

(kitni energy use ki kwh mein)

Heating Effect of Electric current :-

When an electric current passes through a conductor or an electric device, the conductor becomes hot after some time and produce heat. This is called Heating effect or electric current.

Practical Application of Heating Effect of electric current

ex- bulb, toaster, mobilephone, fan

Alloys → High resistivity ⇒ Heat ↑
→ High Melting point
→ Do not oxide

$R = \frac{\rho l}{A}$ $H = i^2Rt$

Joule's law of Heating :-

Heat (H) produced in a Resistor

$H \propto i^2$
$H \propto R$
$H \propto t$

$H = i^2Rt$

J A Ω s

R (i) Pure Resistor

$V = iR$

Electric Bulb :-

• Filament Tungsten (High melting point) is Heated and it emits light. Most of energy consumed appears as heat, only small part as light tungsten has very high melting point.

Electric Fuse - Safety Device :-

• Electrical fuse is used to prevent short circuit. fuse has low melting point.
so, when high current passes through it melts and stop the flow of current.

• Fuse wire in series with the appliance.

• Fuse wire - Alloy of Al, Cu, lead, iron

✡ Fuse wire should have → High resistivity → Resistance ↑
→ low melting point
→ High temperature melt

• If high current flows (more than required) fuse wire gets heated and melts.
Rating of fuse - 1A, 2A, 3A, 4A, 5A, 10A etc

• Rating of fuse wire → maximum current

CURRENT YEARS QUESTIONS

QUESTION-1) (i) An electric lamp filament draws a current of 0.5A and operates for 2hours. Calculate the charge that flows through the circuit.
(ii) if an electric source supplies a charge of 500 coulombs and a device draws a current of 25 mA, determine the time required for the source to be completely discharged. **(CBSE 2024)**

QUESTION-2) (i) The values of current(I) flowing in a given resistor for the corresponding values of potential difference(V) across the resistor are given in the following.

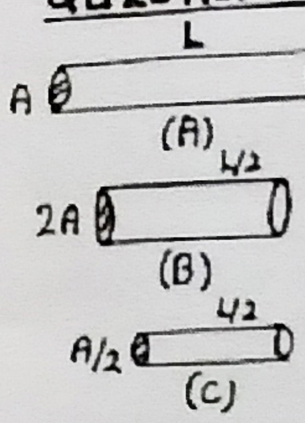
I (Amperes)	0.5	1.0	2.0	3.0	3.5
V(Volts)	1.5	3.0	6.2	9.3	10.8

(a) Plot a graph between V and I.
(b) Calculate the resistance of the resistor with the help of the graph.

(ii) MCQ. for three samples of nichrome wire with Resistance R_1, R_2 and R_3 choose from the following that holds true for his graph.
(a) $R_1 = R_2 = R_3$ (b) $R_1 > R_2 > R_3$ (c) $R_3 > R_2 > R_1$ (d) $R_2 > R_1 > R_3$

(CBSE 2023, 2024)

QUESTION-3) (i) Three cylindrical conductors A, B and C are shown along with their lengths and areas of cross-section. **(CBSE 2021, 2022, 2024) (CBQ)**



if these three conductors are made of the same material and R_A, R_B and R_C are their respective resistances, then find (i) R_A/R_B (ii) R_A/R_C.

(ii) The resistance of a metal wire of length 3m is 60Ω. If the area of cross-section of the wire is $4 \times 10^{-7}\ m^2$, calculate the electrical resistivity of the wire.
State how would electrical resistivity be affected if the wire (of part ii) is stretched so that its length is doubled. Justify your answer.

QUESTION-4) A 6Ω resistance wire is doubled on itself. calculate the new resistance of the wire.
Three 2Ω resistors A, B and C are connected in such a way that the total resistance of the combination is 3Ω. Show the arrangement of the three resistors and justify your answer. **CBSE(2016, 2020, 2023)**

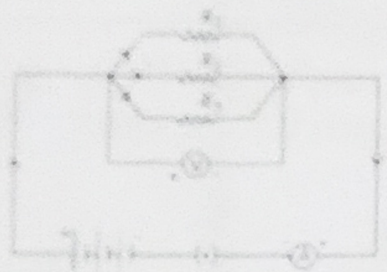
QUESTION-5) (i) state Joule's law of heating. Express it mathematically when an appliance of resistance R is connected to a source of voltage V and the current I flows through the appliance for time t.
(ii) A 5Ω resistor is connected across a battery of 6 Volts. Calculate the energy that dissipates as heat in 10s. **(CBSE 2021, 2022, 2024)**

QUESTION-6) Define electric power and state its SI unit. The commercial unit of electrical energy is known as 'unit'. Write the relation between this 'unit' and joule.
In a house, 2 bulbs of 50W each are used for 6 hours daily and electric geyser of 1kW is used for 1 hour daily. Calculate the total energy consumed in a month of 30 days and it cost at the rate of 8.00 per kWh.
Two bulb rated 100W; 220V and 60W; 220V are connected in parallel to an electric mains of 220V. Find the current drawn by the bulbs from the main. **(CBSE 2020, 2024)**

QUESTION-7) Which type of circuits - series or parallel, should be used when you have to operate different electrical gadgets in your house? List two reasons for your answer. **(CBSE 2020, 2024)**

QUESTION-8) A student wants to use an electric heater, an electric bulb and an electric fan simultaneously. How should these gadgets be connected with the mains? Justify your answer by giving three reasons.

In the circuit given below, the resistors R_1, R_2 and R_3 have the values 10W, 20W and 30W respectively, which have been connected to a battery of 12V. Calculate (a) the current through each resistor (b) the total circuit resistance, and (c) the total current in the circuit.



(CBSE 2019, 2021, 2022)

QUESTION-9) study the following electric circuit in which the resistors are arranged in three arms A, B and C.

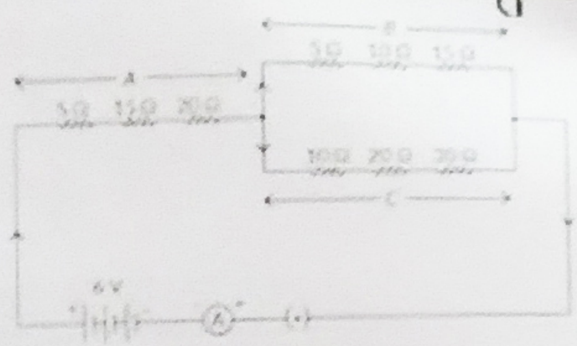
(a) Find the equivalent resistance of arm A.

(b) Calculate the equivalent resistance of the parallel combination of the arms B and C.

(c) (i) Determine the current that flows through the ammeter.

OR

(ii) Determine the current that flows in the ammeter when the arm B is withdrawn from the circuit.



(CBSE 2021, 2022) CBQ

QUESTION-10) (i) Write the formula for determining the equivalent resistance between A and B of the two combinations (I) and (II) of three resistors R_1, R_2 and R_3 arranged as follows

(ii) if the equivalent resistance of the arrangements (I) and (II) are Rs and Rp respectively, then which one of the following V-I graphs is correctly labelled?

(CBSE 2021, 2022)

QUESTION-11) (i) How much current will an electric iron draw from a 220V source if the resistance of its element when hot is 55 ohms? Calculate the wattage of the electric iron when it operates on 220 Volt.

(ii) The potential difference across the two ends of a circuit component is decreased to one-third of its initial value, while its resistance remains constant. What change will be observed in the current flowing through it? Name and state the law which helps us to answer this question.

(iii) Draw a schematic diagram of a circuit consisting of a battery of four 1.5V cells, a 5Ω resistor, a 10Ω resistor and a 15Ω resistor and a plug key, all connected in series. Now find.

(a) The electric current passing through the circuit, and Potential difference across the 10 Ω resistor when the plug key is closed?

(CBSE 2016, 2019, 2020, 2024)

ALAKH sir ke FARREY

MAGNETIC EFFECTS OF ELECTRIC CURRENT

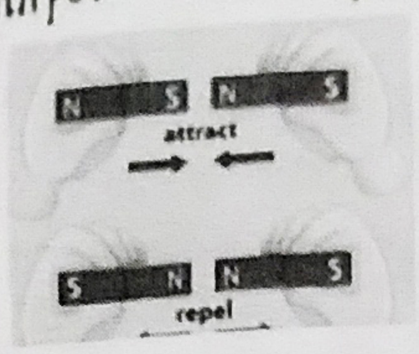
MAGNET :-

An object which attracts pieces of iron, nickel and cobalt.

Two poles of a magnet:-

(1) North pole
(2) South pole

like poles → Repel
Unlike poles → Attract



Magnetic Compass:-

- A compass is small magnet inshape of needle.
- it detects the presence of a magnet or magnetic field.
- When a magnet or magnetic field is around its deflects.
- stronger the magnet/ field, more is deflection.

Magnetic field(B) :-

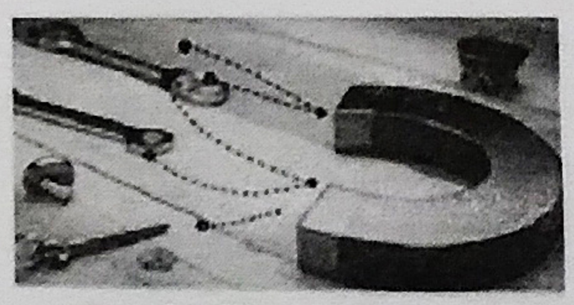
- The space surrounding a magnet in which other magnets or magnetic material feels a force.

it is a quantity that has both directions and magnitude.

Direction of Magnetic field(B):-

The path along which a free North pole moves.

N ← N S ← N
N ← ← N



Magnetic Fieldlines (MFL):-

imaginary lines along which a free North pole moves.

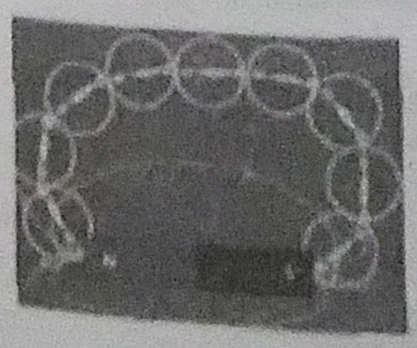
Properties of Magnetic field lines.

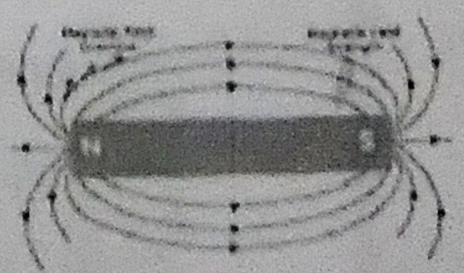
- outside Magnet
- Inside Magnet
- closed Curves
- Two field lines cannot cross/intersect eachother.

imp because if they do, at the point of intersection, North poles of magnetic needle will point towards two directions which is impossible.

X compass — if they cross

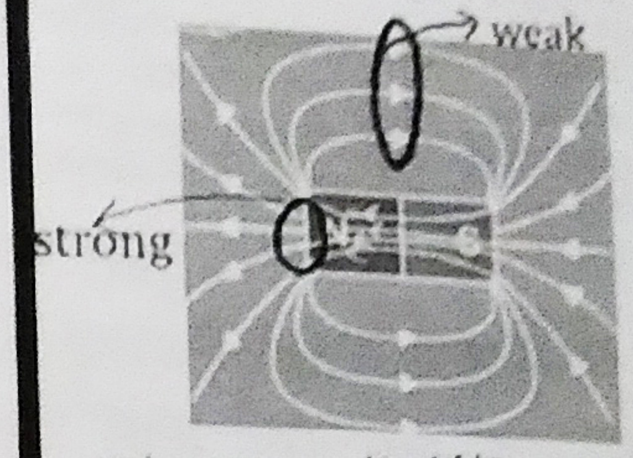
Magnetic field(B) → direction → MFL



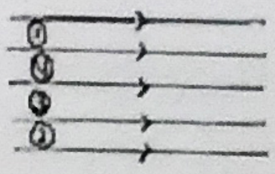


Magnitude of Magnetic field:-

- Field lines closer (Crowded) → Magnetic field strong
- Field lines far → Magnetic field weak.



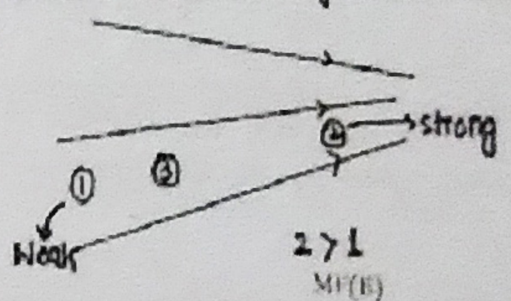
Uniform magnetic field:-



Parallel lines Magnetic field lines (MFL) equal distance

uniform MF

Non- uniform Magnetic field



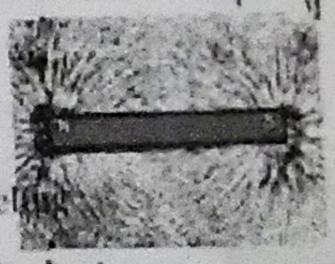
Activity 12.2 SACH KI FIELD LINES

- Sprinkle some iron fillings uniformaly around bar magnet.

Tap → arrangement

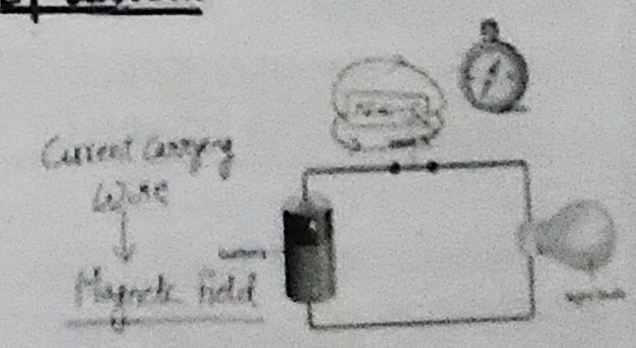
- Iron fillings

In the direction of Magnetic field lines.



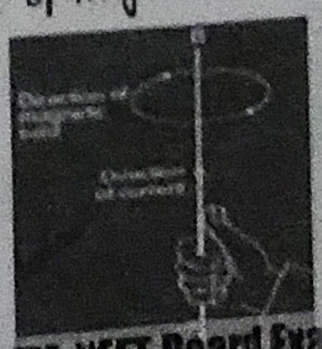
iron feelings

Oersted Discovery magnetic effect of current



Maxwell's Right hand thumb Rule :-

Imagine that you are grasping (or holding) the current carrying wire in your right hand so that your thumb points in the direction of current, then the direction in which your fingers wrap the wire will give the direction of magnetic field lines around the wire.



Activity 12.1 → Oersted Discovery

Iron filling ← Iron ka chooran

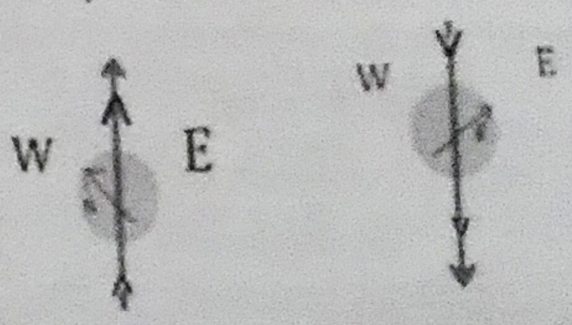
magnetic field concentric circle in halo har

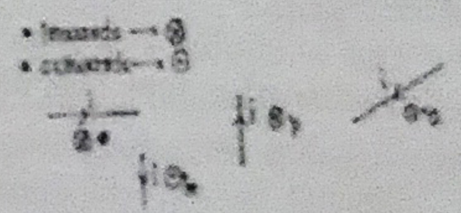
Factors on which Magnetic field due to straight wire depends

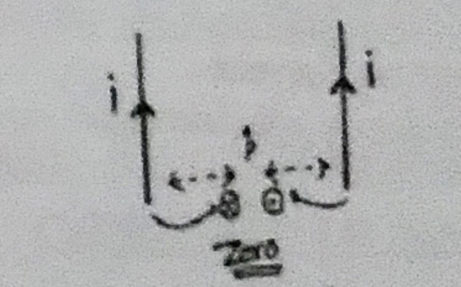
- current (i) → More current → strong magnetic fields
- Distance (d) → More Distance → Weaker magnetic fields
- change direction of current.

Reverse i direction → Magnetic field lines reverses

Activity 12.3 current wire placed over compass

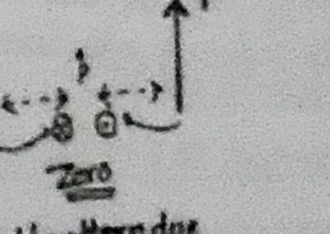






Magnetic field pattern due to a circular loop carrying current

Trick



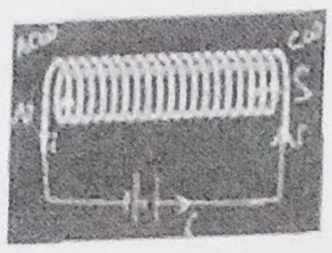
(i) current I ↑ ⇒ Magnetic field ↑ B↑

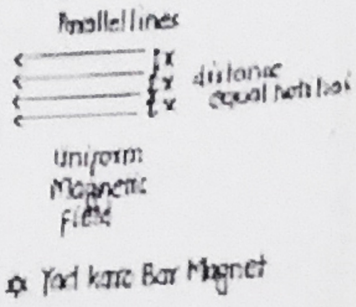
(ii) no. of turns n↑ ⇒ Magnetic field ↑B↑

(iii) Radius r↓ ⇒ Magnetic field ↑B↑

Magnetic field lines due to a solenoid :-

A coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder

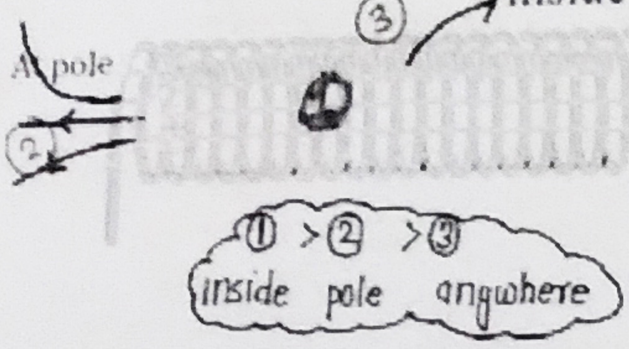




✡ Yad karo Bar Magnet

Strength of Magnetic field :-

Inside → uniform magnetic field
↓
Andar har point pe equal (same) hai



Strength of a magnetic field due to a solenoid depends on

(i) number of turns ↑ ⇒ Magnetic field ↑

(ii) current (i) ↑ ⇒ Magnetic field ↑

(iii) The gap between the turns reduced ↓
↓
magnetic field ↑

Direction of current Reverse
↓
Polarity Reverse

Electromagnet :-

✓ A long coil of insulated copper wire wrapped around a soft iron core.

✓ Electromagnet is temporary magnet.
Jabtak hai current Tabtak hai magnet.

✓ An electromagnet works on magnetic effects of current.

✓ The poles of electromagnet can be reversed.

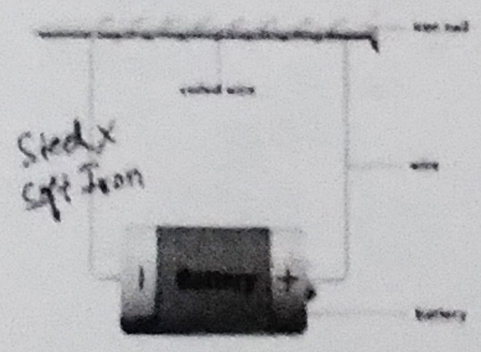
Strength of Electromagnet :-

(i) number of turns in the coil ↑ ⇒ magnetic field ↑

(ii) The current flowing in the coil (i) ↑ ⟹ magnetic field ↑

(iii) The length of air gap between turns reduced ↓
↓
magnetic field ↑

Simple Electromagnet



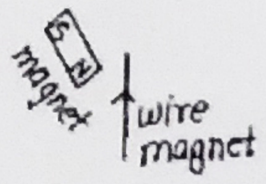
steel use nhi karte hai kyuki ushe ek bar magnet bana do to permanent magnet bann jata hai.

	Bar Magnet	Solenoid	Electromagnet
Definition	A permanent magnet in the form of a bar	A coil of wire wound in a cylindrical shape	A solenoid with a soft iron core
Shape of magnetic field	Similar to that of a solenoid	Similar to that of a bar magnet	Similar to that of a bar magnet
Magnetic field	Permanent and fixed	Temporary, exists only when current flows	Temporary, but stronger than solenoid
Polarity	Fixed, cannot be changed	Can be reversed by changing current direction	Can be reversed by changing current direction

Force (F) on current - carrying conductor placed in a magnetic field.

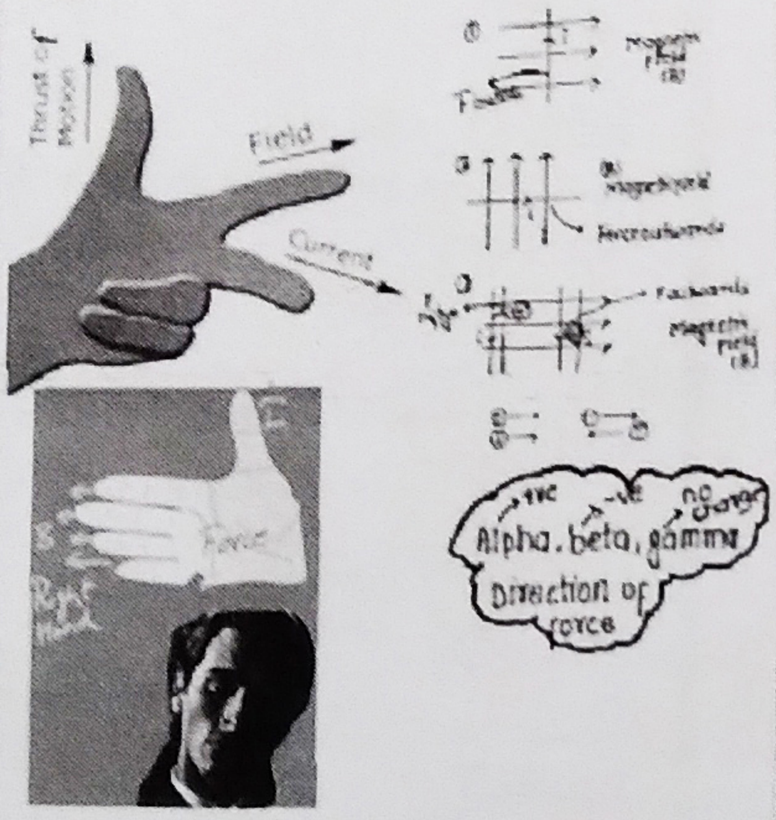
When a current - carrying conductor is placed in a magnetic field, a force is exerted on the conductor which can make the conductor move.

current carrying wire → Magnet
↓
magnetic field
↓
Experience force



Fleming's left Hand Rule for the Direction of force :-

According to fleming's left hand rule - Hold the forefinger the centre finger and the thumb of your left hand at right angles to one another. Adjust your hand in such way that the forefinger points in the direction of magnetic field and the centre finger points in direction of current, then the direction in which thumb points, gives the direction of force acting on the conductor



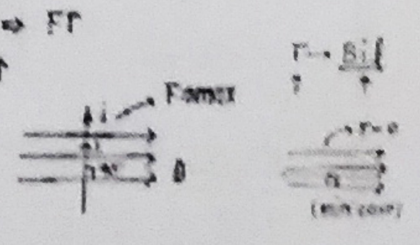
FACTORS ON WHICH FORCE ON CURRENT WIRE DEPENDS :-

(i) current (i) ↑ ⇒ F ↑

(ii) Magnetic fields (B) ↑ ⇒ F ↑

(iii) length (l) ↑ ⇒ F ↑

(iv) Angle (sinθ)



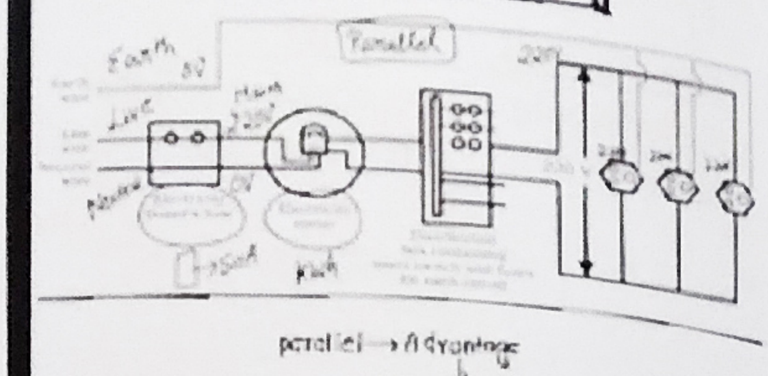
D.C
Direct Current

(1) Do not change its direction.
(2) obtained from cell battery.
(3) Repulsive.
(4) Voltage can not be changed
(5) More power loss over long transmission.

A.C
Alternating current

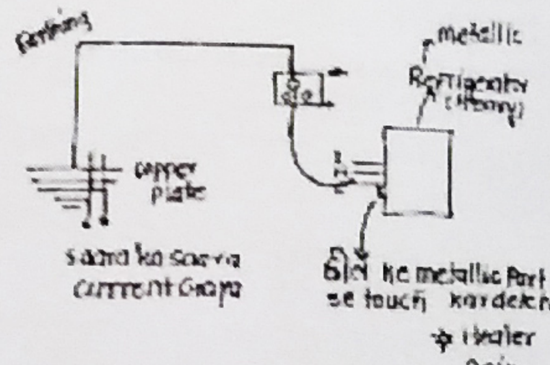
(1) change its direction
(2) obtained from electric power plants with A.C Generators
(3) Attractive
(4) Voltage can be changed
(5) less power loss over long transmission.

Domestic Electric circuits or Domestic wiring :-

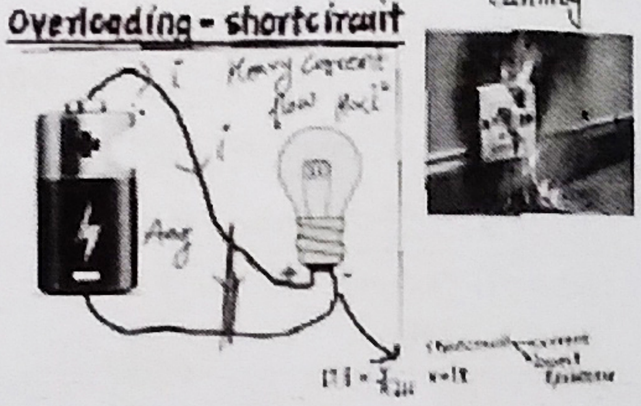


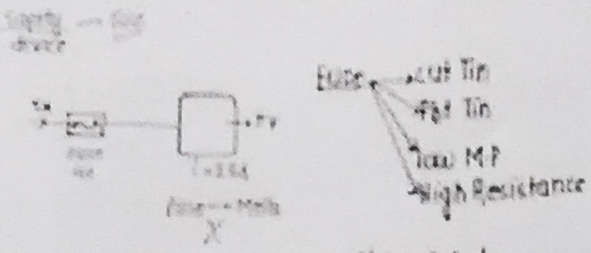
parallel → Advantage
↓
different device different current
↓
different device same voltage 220V
↓
1 device fail no effect on other device

Earthing of electrical Appliances



Overloading - short circuit

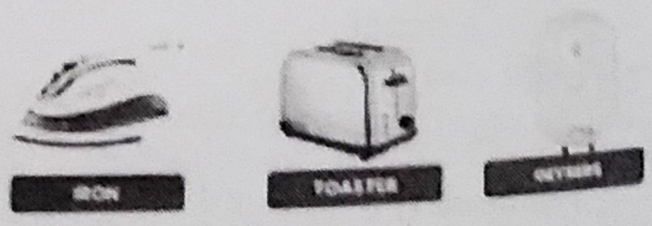




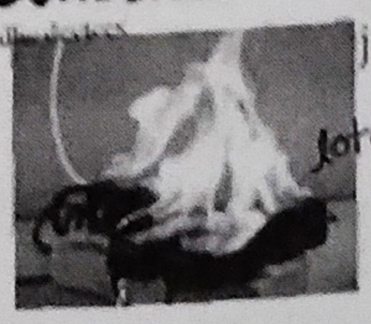
- Fuse wires are made of thin plated copper with a low melting point to melt easily during a short circuit. Pure copper is unsuitable due to its high melting point.

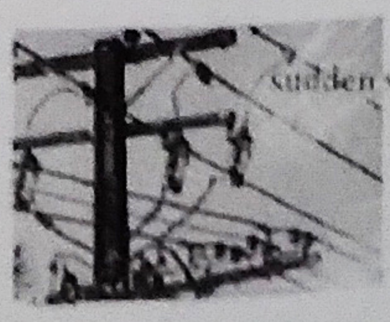
A 15A fuse → heavy appliances like iron, geysers and toasters.

A 5A fuse → bulbs, fans, etc



OVERLOADING





MAGNETIC EFFECT OF CURRENT CYQ

Question-1) A student fixes a sheet of white paper on a drawing board using some adhesive materials. She places a bar magnet in the centre of it and sprinkles some iron filings uniformly around the bar magnet using a salt-sprinkler. On tapping the board gently, she observes that the iron filings have arranged themselves in a particular pattern.

(a) Draw a diagram to show this pattern of iron filings.

(b) What does this pattern of iron filings demonstrate?

(c) (i) How is the direction of the magnetic field at a point determined using the field lines? Why do two magnetic field lines not cross each other?

OR

(ii) How are the magnetic field lines of a bar magnet drawn using a small compass needle? Draw one magnetic field line each on both sides of the magnet.

CBSE (2017, 2021, 2022, 2024)

Question-2) (i) Two magnetic field lines do not intersect each other? Why?

(ii) How is a magnetic field in a given region represented? Draw a diagram in support of your answer.

CBSE (2016, 2024)

Question-3) Draw the pattern of the magnetic field produced around a vertical current carrying straight conductor passing through a horizontal cardboard. Mark the direction of current and the magnetic field lines. Name and state the rule which is used to determine the direction of magnetic field associated with a current carrying conductor.

CBSE (2021, 2022, 2023)

Question-4) (i) What is a solenoid?

(ii) Draw the pattern of magnetic field lines of the magnetic field produced by a solenoid through which a steady current flows.

(iii) What happens when a bundle of wires of soft iron is placed inside the coil of a solenoid carrying a steady current? Name the device obtained. Why is it called so?

CBSE (2015, 2019, 2020, 2021, 2024)

Question-5) Fast a current in a long straight solenoid, N and S poles are created at the two ends. Among the following statements, the incorrect statement is:

(a) the magnetic field lines inside the solenoid are in the form of straight lines, which indicates that the magnetic field is uniform at all points inside the solenoid.

(b) the strong magnetic field produced inside the solenoid can magnetize the soft iron placed inside it.

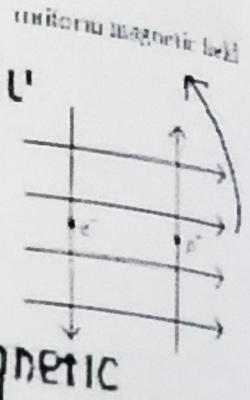
(c) the pattern of the magnetic field associated with a current carrying solenoid is different from the pattern of the magnetic field around a bar magnet.

(d) the N and S poles exchange positions when the direction of current through the solenoid is reversed.

CBSE (2023, 2024)

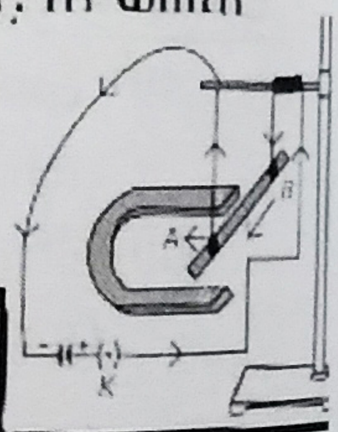
Question-6) What are magnetic field lines ? List three characteristics of these lines.
(i) Describe in brief an activity to study the magnetic field lines due to a current carrying circular coil.
(ii) Write one use of the strong magnetic field produced inside a current carrying solenoid.
CBSE (2016, 2017, 2020, 2021, 2022, 2023)

Question-7) (i)
A uniform magnetic field exists in the plane of paper as shown in the diagram. In this field, an electron (e^-) and positron (p^+) enter as shown. The electron and positron experience forces.
(a) both pointing into the plane of the paper.
(b) both pointing out of the plane of the paper.
(c) pointing into the plane of the paper and out of the plane of the paper respectively.
(d) pointing out of the plane of the paper and into the plane of the paper respectively.



(ii) Name and state the rule to determine the direction of a:
(a) magnetic field produced around a current carrying straight conductor.
(b) force experienced by a current carrying straight conductor placed in a magnetic field which is perpendicular to it. CBSE (2021, 2024 CBQ)

Question-8) A student was asked to perform an experiment to study the force on a current carrying conductor in a magnetic field. He took a small aluminium rod AB, a strong horseshoe magnet, some connecting wires, a battery and a switch and connected them as shown. He observed that on passing current, the rod gets displaced. On reversing the direction of current, the direction of displacement also gets reversed. On the basis of your understanding of this phenomenon, answer the following questions
(a) Why does the rod get displaced on passing current through it ?
(b) State the rule that determines the direction of the force on the conductor AB.
(c) If the U shaped magnet is held vertically and the aluminium rod is suspended horizontally with its end B towards due north, then on passing current through the rod B to A as shown, in which direction will the rod be displaced? CBSE (2021, 2022, 2023) CBQ



Question-9 (i) Differentiate between direct and alternating current. Name the type of current produced by the power plants in our country. Also state its frequency.
(ii) Give reasons for the following:
(a) It is dangerous to touch the live wire of the main supply rather than neutral wire.
(b) In a household circuit, a parallel combination of resistances is used.
(c) Using a fuse in a household electric circuit is important.
(d) Tungsten is used exclusively for filaments of electric lamps.
CBSE (2015, 2017, 2018, 2019, 2023) CBQ

Question-10) An alpha particle while passing through a magnetic field gets projected towards north. In which direction will an electron project when it passes through the same magnetic field ?
CBSE (2021, 2022, 2023, 2024)

ALAKH sir ke FARREY

OUR ENVIRONMENT

Ecosystem :-

Components of Ecosystem

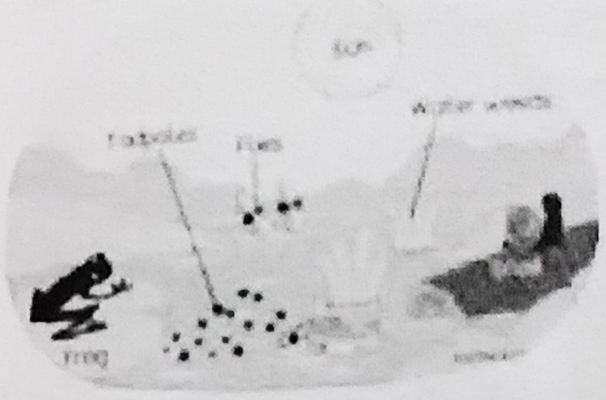
(1) (Abiotic) Non-living component of ecosystem
↓
Physical or climatic factor
soil, water, Air, light, pH.
Temperature, Rainfall.

(2) (Biotic) Living component of ecosystem

Producer (Autotrophic)
- Green plants
- cyanobacteria

consumers
- Herbivores
- Carnivores
- Omnivores

Decomposer (saprotrophic)
- Microorganisms (bacteria and fungi)



Types of Ecosystem

Natural :-

Terrestrial Ecosystem
(land-based Ecosystem)

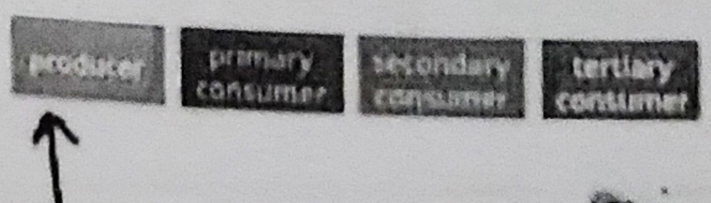
- ✓Desert
- ✓Grass land
- ✓Forest
- ✓Mountain

Acquatic Ecosystem
(water-based Ecosystem)

- ✓River
- ✓Pond
- ✓lakes
- ✓sea

Artificial :-

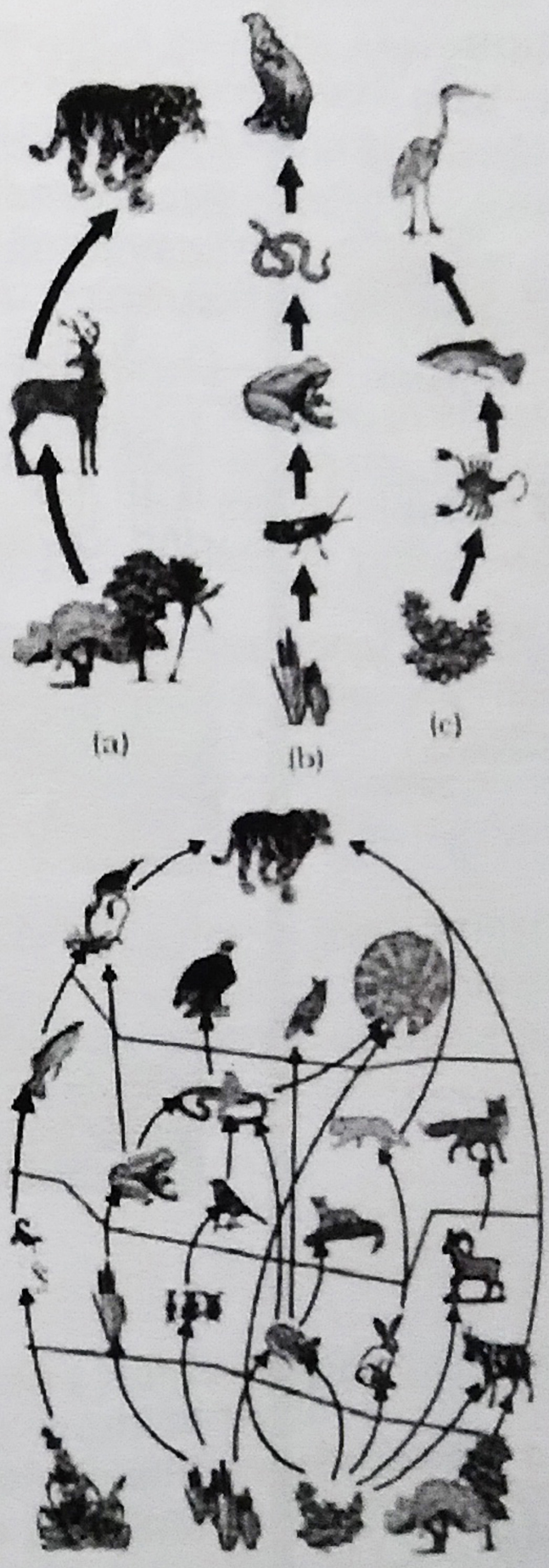
Man-made Ecosystem
Crop-field (Agricultural land)
Garden, Parks, Parks,
Aquarium, poultary farms
Zoo.



Functioning of Ecosystem

✓The producers, synthesis complex food with the help of solar energy, carbon dioxide sunlight and minerals (soil).

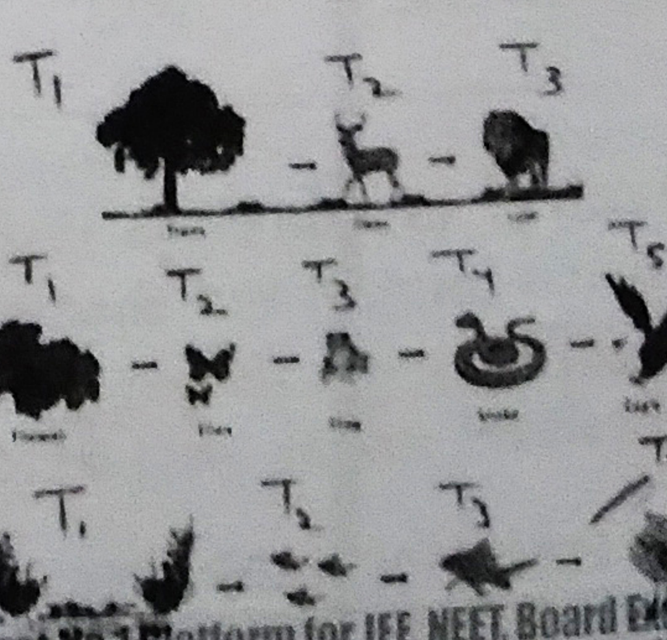
- ✓Die consumers eat up plants and other animals as food, so energy is transferred to next organism.
- ✓When plants and animals die, then decomposers act/ feed on dead remains of their bpd and decompose them into simple materials like CO_2, water & minerals

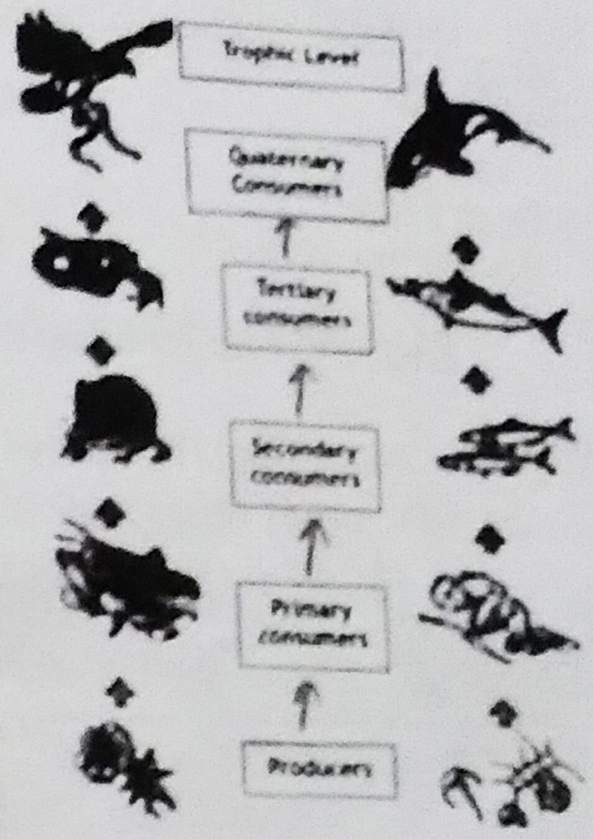


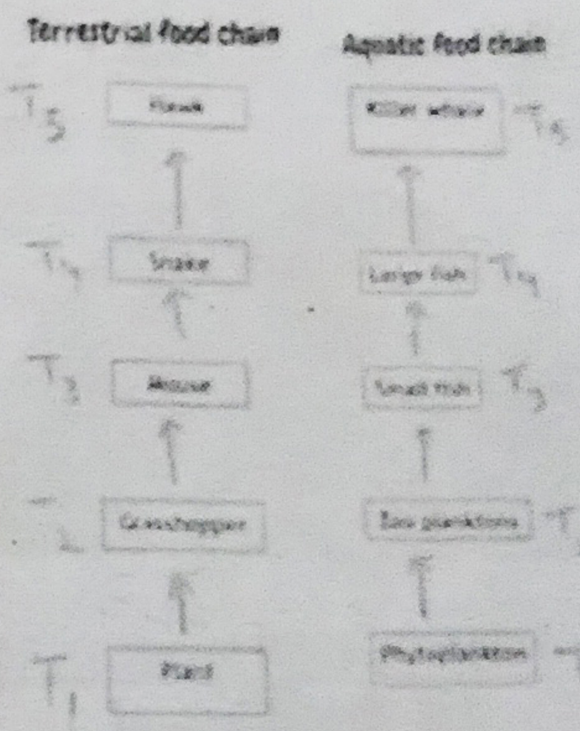
Food chain :-

Food chain - The sequence of living organisms in which one organism consumes another organism to transfer foodenergy.

Trophic level - position of an organism in a food chain.

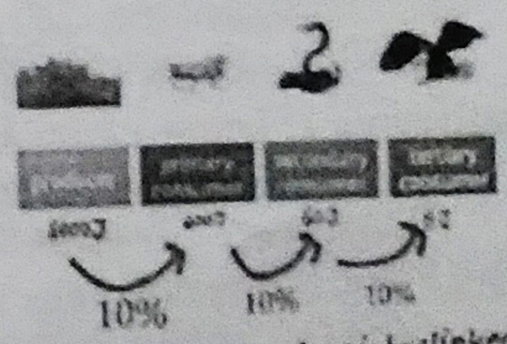






10% (Ten percent) law of energy transfer

According to this law only 10% of energy is transferred from one trophic level to next successive trophic level



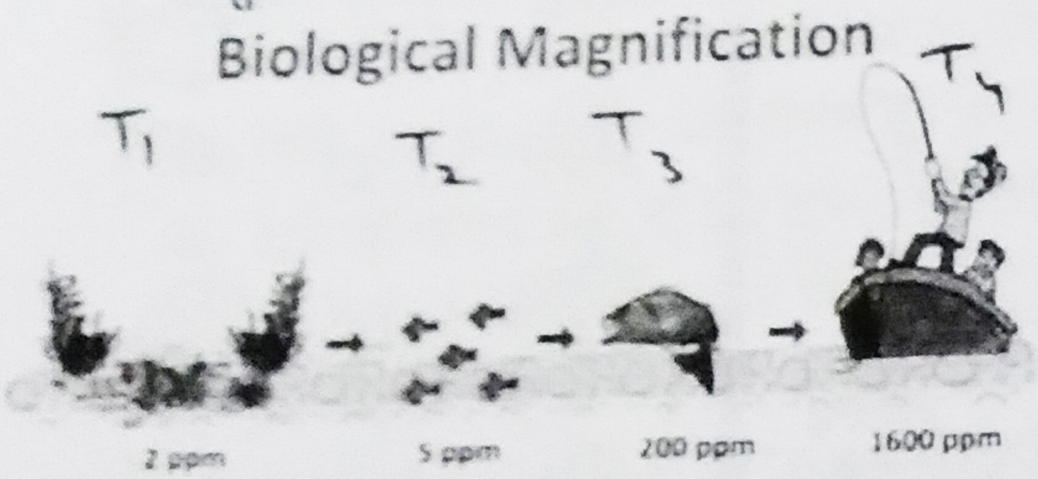
Food web - The network of interlinked food chains.

Biomagnification

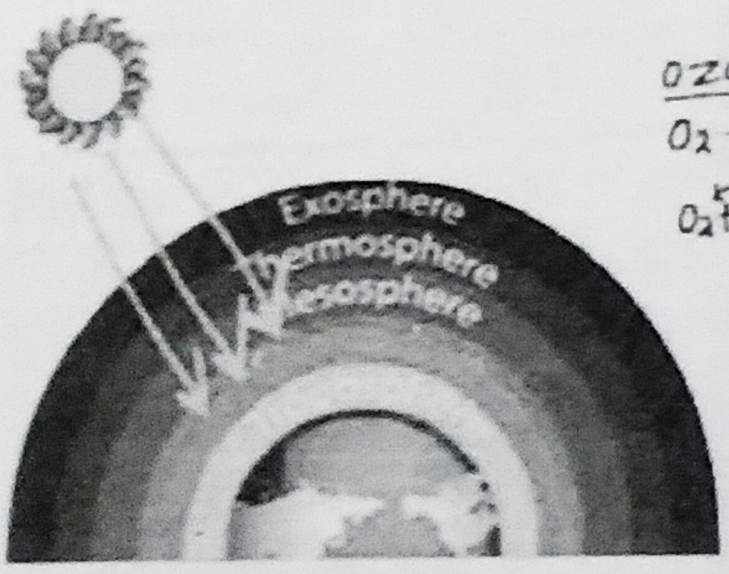
it is the increase in the concentration of toxins or non-biodegradable substances in the body tissues of organisms as it moves from one trophic level to the next.

Non-biodegradable and toxic chemicals such as-

Insecticides
Pesticides
Heavy metals, etc



layers of the Atmosphere



Ozone gas

$O_2 \xrightarrow{U.V\ rays} O + O$

$O_2 + O \longrightarrow O_3$ ozone

Environmental problems and its management

Ozone layer Depletion

step-1) chlorofluorocarbon (CFC) emissions reach the ozone layer.

step-2) CFCs are broken down by the sun's ultraviolet (UV) rays, releasing chlorine atoms into the ozone layer.

step-3) Active chlorine atoms break down the ozone molecules, causing ozone layer depletion.

step-4) More ultraviolet rays reach the earth, threatening human health.

Causes of ozone layer Depletion

✓ Chlorofluorocarbon
✓ Hydrochlorofluorocarbon
✓ Methyl bromide
✓ Methyl chloroform

Effects of ozone layer Depletion

✓ skin cancer
✓ cataract
✓ DNA damage
✓ Reduced immunity
✓ sunburns
✓ low crop productivity
✓ Destruction of marine life

Types of wastes

Biodegradable waste	Non-biodegradable waste
Material that can be decomposed (broken down into simpler substances) by the action of microorganisms	Material that can not be decomposed (broken down into simpler substances) by the action of microorganisms
Safe for environment	Not Safe for environment and caused pollution
Made up of natural substances	Made up of synthetic materials
Biodegradable substances persist for less time in the environment	Non Biodegradable substances persist for longer time in the environment
E.g. Wood, paper, fruit, vegetable peels, wood etc	E.g. Aluminium cans, iron nails, silver foil DDT and radioactive waste

Waste Management

Preparation of compost-

Biodegradable wastes can be converted into compost by burying in a pit.

Land fills-

Disposal of wastes by putting it in low lying area of ground and covering it with oil.

OUR ENVIRONMENT CYQ

Question-1) (i) identify the food chain in which the organisms of the second tropic level are missing
(a) Grass, goat, lion
(b) Zooplankton, phytoplankton, smallfish, largefish (d) Grasshopper, grass, snake, frog, eagle.
(c) Tiger, grass, snake, frog.

(ii) Food web is constituted by
(a) relationship between the organism and the environment.
(b) relationship between plants and animals.
(c) various interlinked food chains in an ecosystem.
(d) relationship between animals and environment.

(iii) Assertion (A): Green plants trap only 1% of the energy of sunlight that falls on their leaves.
Reason (R): All green plants are the producers in a food chain.
(a) Both Assertion(A) and Reason(R) are true and Reason(R) is the correct explanation of the Assertion(A). (b) Both Assertion(A) and Reason(R) are true, but Reason(R) is not the correct explanation of the Assertion(A). (c) Assertion (A) is true, but Reason(R) is false.
(d) Assertion(A) is false, but Reason(R) is true.

(CBSE 2020, 2024)

Question-2) (i) Use of several pesticides which results in excessive accumulation of pesticides in rivers or ponds, is a matter of deep concern. Justify this statement.
(ii) state the possible disadvantage if the cereal plant is growing in soil rich in pesticides
(iii) Give one method which could be applied to reduce our intake of pesticides through food to some extent.
(iv) "Energy flow in food chains is always unidirectional." Justify this statement. Explain how the pesticides enter a food and subsequently get into our body.

(CBSE 2015, 2020, 2023)

Question-3) (a) study the picture given below showing three food chains (a), (b) and (c) and answer the following questions.
(i) Name the type of ecosystems that exist in food chains (b) & (c)
(ii) The first trophic level in all food chains are producers. Why? What percentage of solar energy do these producers capture of their use?
(b) Plants → Rats → Snakes → Hawks

(i) In the following food chain, plants provide 500J of energy to rats. How much energy will be available to hawks from snakes?
(ii) In the given food chain, what will be the impact of removing all the organisms of second trophic level on the first and third trophic level? Will the impact be the same for the organisms of the third trophic level in the above food chain if they were present in a food web?

(c) Write the percentage of
(i) solar energy captured by the autotrophs and.
(ii) energy transferred from autotrophs to the next level in a food chain.

CBQ (CBSE 2017, 2020, 2021, 2022, 2023, 2024)

Question-4) (a) What is an ecosystem?
(b) state one ill-effect of the absence of decomposers from a natural ecosystem.
(c) (i) List two human-made and Natural ecosystems.
(d) What are the trophic levels? Why do different food chains in an ecosystem not have more than four to five trophic levels? Give reason.

(CBSE 2020, 2021, 2022, 2023)

Question-5) (a) A gas 'X' which is a deadly poison is found at the higher levels of atmosphere and performs an essential function. Name the gas and write the function performed by this gas in the atmosphere. which chemical linked to the decrease in the level of this gas? What measures have been taken by an international organisation to check the depletion of the layer containing this gas?

(b) How is ozone formed in the higher levels of the atmosphere? Why should ozone layer be protected to save the environment?

(c) Why is ozone layer getting depleted at the higher levels of the atmosphere? Mention one harmful effects caused by its depletion.

· CBQ (CBSE 2017, 2021, 2022, 2023, 2024)

Question-6) (a) Some wastes are given below. Garden waste Ball point pen refills Empty medicine bottles made of glass peels of fruits and vegetables old cotton shirt The non biodegradable wastes among these are.

(a) (i) and (ii)
(b) (ii) and (iii)
(c) (i), (iv) and (v)
(d) (i), (iii) and (iv)

(b) Write one difference between biodegradable and non-biodegradable wastes. List two impacts of each type of the accumulated wastes on environment if not disposed off properly.

(c) (a) What is meant by garbage? List two classes into which garbage is classified.
(b) What do we actually mean when we say that "enzymes are specific in their action"?

(CBSE 2021, 2022, 2023, 2024)

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Mark Improvement Program

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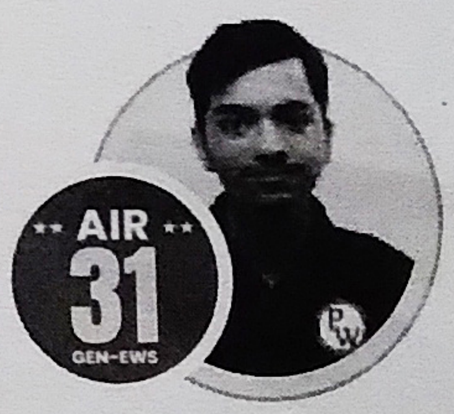

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Exam Mode : Online/Offline

ONLINE (Daily)	10th Feb–25th Feb
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SKDS

Why good marks is not a measure of your skills that will actually help in life?

Most students still run after marks in India, thanks to the kind of education system we have which hails good marks as one of the top achievements in life. But good marks cannot measure your in-depth understanding of the subject concepts or your problem-solving skills.

Success and recognition for students are measured in terms of "marks" or "grades" secured and/or awards won. In the absence of other easily available objective criteria to assess students, many stakeholders are forced to rely on the marks/grades secured.

While the importance of marks/grades cannot be undermined, it is perhaps inappropriate to focus merely on this. Students should be encouraged to fully assimilate and integrate the knowledge across various subjects/courses and develop the ability to apply knowledge gained in real-life contexts.

Why marks doesn't measure your real worth?

Marks secured and awards won are recognition of hard work and relatively better performance in various assessments. Yet, this can perhaps only help initially in enabling access to various career advancement opportunities.

"Marks may not always be able to adequately capture the ability to identify problems, critically evaluate alternatives and suggest appropriate solutions."

Often, one is required to work in diverse groups to resolve complex issues affecting various stakeholders.
Needless to emphasize, this requires a deep understanding of various topics learned formally through taught courses or developed through additional reading, interactions with colleagues and experience.

Here are 10 points every young student or professional need to think about when it comes to marks vs concepts:

- Enjoy the process of learning and do not focus only on the end result.
- Professional life will be fraught with uncertainty so do not be disheartened by small setbacks.
- Knowledge gained will stay with you for eternity.
- Be open-minded learn new things even if does not seem to be relevant now.
- Knowledge can be gained in different ways in the classroom, from experiences of your role models, from peers from other media.
- Develop the ability to see big picture.
- Develop the ability to integrate knowledge across various topics learning in silos does not take one far.
- Knowledge gained is not useful unless it can be applied appropriately to resolve issues.
- Develop empathy for people around you.
- Be humble.

- Article by Prof. Vrishali N Bhat, Associate Professor and Chairperson PGP, TA Pai Management Institute, Manipal

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